

SOCIO-ECONOMIC SURVEY  
OF  
SMALLHOLDER FARMING SYSTEMS IN SOLOMON ISLANDS

AFIO  
MALAITA PROVINCE

Agricultural Economics Section  
Rural Services Project  
Ministry of Agriculture and Lands  
Solomon Islands

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## Abbreviations and Units of Measure

AES	Agricultural Economics Section (RSP)
CEMA	Commodities Exporting and Marketing Authority
DCRS	Dodo Creek Research Station
LDA	Livestock Development Authority
MAL	Ministry of Agriculture and Lands
PBME	Project Beneficiary Monitoring and Evaluation (RSP)
RDC	Rural Development Centre (RSP)
RSP	Rural Services Project
km	kilometre = 1,000 m
ha	hectare = 10,000 sq m
m	metre
MT	metric tonne = 1,000 kg
SIS	Solomon Islands Dollar

## Acknowledgements

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## Chapter: 1

### INTRODUCTION

1.1 The Solomon Islands comprise a double chain of islands extending in a north-west south-east direction over 860km of the south-west Pacific between latitudes  $5^{\circ}$ - $12^{\circ}$ S and longitudes  $155^{\circ}$ - $170^{\circ}$ E. The islands lie directly along a major line of crustal weakness traversing the western Pacific and are the surface expressions of fault-bounded blocks and troughs originating in a zone of geologically intense activity. Warping and block movement are the most significant geomorphic processes responsible for the elevation of land to its present altitude, with marine sediments occurring on some of the highest ranges. Such processes continue spasmodically and raised reefs at various heights occur in many parts of the country, as does intense faulting. Earthquakes are frequent and often initiate land movements in ground already close to shearing point such as saturated soil at the heads of steeply incised gullies, resulting in debris slides among the high ridges (10).

1.2 Solomon Islands lies well within the geographical tropics in an oceanic area where two contrasting trade winds meet, a low-pressure belt of ascending air known as the "inter-tropical convergence zone" (ITCZ). In this zone warm and humid air masses drawn from equatorial regions meet relatively cool and dry sub-tropical air derived from the south-east. From about March to November the islands experience steady, shallow, south-easterly winds. During November and December unsettled weather is likely as the ITCZ moves south over the islands, from which follows steady north-westerly winds. March and April are again unsettled as the ITCZ returns northwards until the south-easterly trade winds become re-established. Cyclonic disturbances may be generated, particularly around December and April when the convergence of the two air streams is strongest. Weather is varied, both temporally and spatially, but is characterised by continually high average temperatures and humidity. Most land areas have a mean annual rainfall of 3,000-5,000mm with variations depending on latitude and orientation to prevailing winds. Temperatures are more uniform, at around  $26^{\circ}$ C in the lowlands, and never reach extremes which would restrict plant growth. Night time humidity exceeds 90%. This may fall to 60% on clear sunny days, or remain close to saturation point during cyclonic conditions (10).

1.3 The islands are rugged, with a predominance of ridge-valley landscapes and high relief. Undulating rolling landscapes have a limited distribution and extensive fluvial plains are uncommon. Chemical weathering is intense under conditions of continuously high temperature and moisture, however, soil depths are not generally great. Most hill areas have slopes exceeding 12-15° and commonly reach 35-55° among the mountain ridges. Continual soil wash and creep and periodic mass movements effectively keep pace with rock weathering. Only on stable flatter sites do deep profiles develop. The islands for the most part are covered in dense forest, some fire disclimax grassland in parts of Guadalcanal<sup>(10)</sup> and Florida Islands, and land cleared or cultivated.

1.4 The population of Solomon Islands from the 1986 census was 285,176, with an annual growth rate of 3.5%. The land area of 28,370sq km gives a low overall population density of 10 persons per sq km. Settlements are mostly along the coastal margins so that in some parts of the country population densities are high.

1.5 The population distribution of Solomon Islands is summarised in diagram 1.1 and key socio-economic data are presented in table 1.1

1.6 There is a considerable variation between land area and population among the provinces. While Western Province accounts for 33% of the national land area it contains only 19% of the population. The West is characterised by low population density compared to provinces such as Central, Malaita and Temotu. Although Temotu contains 5% of the national population it also accounts for only 3% of the national land area, and therefore has a relatively high mean population density. Land area in Solomon Islands is summarised in diagram 1.2.

Table: 1.1  
SOLOMON ISLANDS KEY DATA

Province	Western	Ysabel	Central	Guadalcanal	Honiara
<b>POPULATION</b>					
1986 population	55,250	14,616	18,457	49,831	30,413
annual growth rate	3.0	3.2	2.9	4.3	6.8
% national population	19	5	6	17	11
peri-urban population	3,710	1,901	1,622		30,413
% peri-urban	7	13	9	38	
number of households	7,942	2,362	3,079	8,072	4,317
<b>LAND AREA</b>					
land area (sq km)	9,312	4,136	1,286	5,336	22
% land area	33	15	5	19	0
population density/sq km	6	4	14	9	1,382
<b>1987 PROVINCIAL GOVERNMENT REVENUE AND EXPENDITURE (SIS'000)</b>					
revenue	443	173	191	281	1,033
grants	2,556	634	623	1,247	704
current expenditure	3,504	849	750	1,431	1,561
capital expenditure	200	58	88	192	177
net revenue (negative)	(705)	(100)	(24)	(96)	(2)

Province	Malaita	Makira	Temotu	Total
<b>POPULATION</b>				
1986 population	80,032	21,796	14,781	285,176
annual growth rate	2.7	3.6	2.8	3.5
% national population	28	8	5	100
peri-urban population	3,252	2,588	1,295	44,781
% peri-urban	4	12	9	16
number of households	12,417	3,278	2,375	43,842
<b>LAND AREA</b>				
land area (sq km)	4,225	3,188	865	28,370
% land area	15	11	3	100
population density/sq km	19	7	17	10
<b>1987 PROVINCIAL GOVERNMENT REVENUE AND EXPENDITURE (SIS'000)</b>				
revenue	339	485	160	3,103
grants	1,891	1,095	445	9,195
current expenditure	2,190	1,472	615	12,371
capital expenditure	331	600	0	1,646
net revenue (negative)	(291)	(492)	(10)	(1,719)

Source: Statistics Office Statistical Bulletin 15/87 "Provincial Statistics"  
Population data revised from Statistics Office Statistical Bulletin 3/88 "Solomon Islands Population Census"

## POPULATION COMPOSITION

% by province

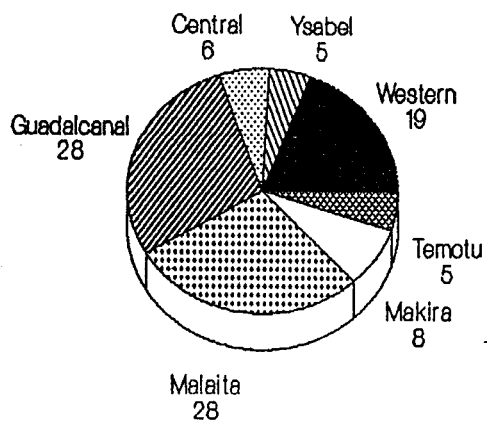


Diagram: 1.1

## LAND AREA

% by province

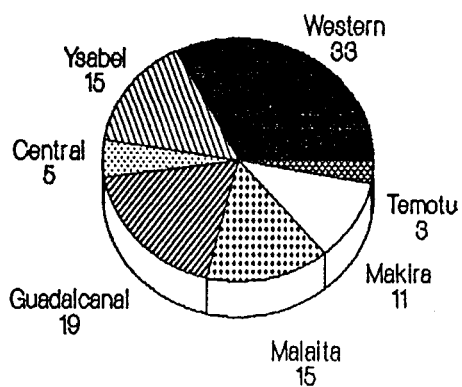


Diagram: 1.2

1.7 While a provincial comparison presents a broad indication of population densities throughout the country, differences within provinces are of significance to agricultural policy. With improvements in communications and administrative links there has been a general migration to the coastal margins where travel and marketing are easier, and where services such as schooling and health are more readily available. The highland interior tends to be sparsely populated in comparison.

1.8 While the overall population density is low, in some areas a growing population pressure is causing concern. Traditional farming systems based on forest fallow may be sustained under conditions of low pressure, but run into soil fertility and related problems when fallow periods are reduced and cropping intensified. Conversely, there are sparsely populated areas of agricultural potential where communications and services are poorly developed. The Rural Services Project is developing facilities in areas of high agricultural potential, providing marketing and transport infrastructure, agricultural and training services, and extending the coverage of adaptive research. These provide new opportunities for agricultural development.

1.9 The capacity of government to implement development programmes is to a large extent determined by funds and resources available. Diagram 1.3 summarises provincial government revenue and expenditure in 1987. Nationally there was a deficit of SI\$1.7 million arising through over expenditure in all provinces. Provincial finance is characterised by a low revenue earning capacity, being nationally about one third of the level of central government grants. Revenue and grants are expended almost entirely on basic operating costs, although these remain severely constrained and under-funded. There are little or no funds for development, and investment amounted to only 12% of total expenditure in 1987.

1.10 Agriculture accounted for 42% of export earnings in 1985<sup>(11)</sup>, although this has dropped from the much higher level of 87% in 1960. It is the major employment activity in the country and the source of livelihood for the majority of the population.

## GOVERNMENT FINANCE SI\$'000 by province (1987)

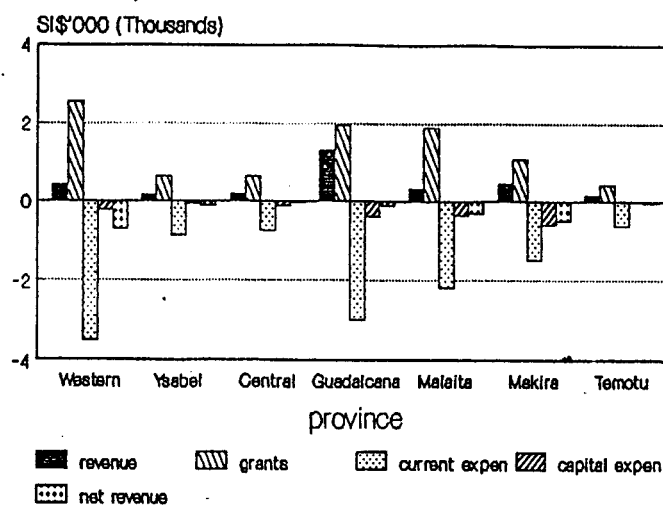


Diagram: 1.3

1.11 Despite various studies undertaken in the past, there is little hard socio-economic data on smallholder farming systems which would assist agricultural policy makers, trainers, extension workers and researchers in the planning, implementation and evaluation of development activities. A<sup>(5)</sup> national sample survey of agriculture was conducted in 1974-75, but these data are no longer able to satisfy information requirements.

1.12 The Agricultural Economics Section (AES) was established under the Rural Services Project (RSP) inter alia in order to generate statistical information on smallholder production systems for the quantification of constraints to agricultural development and the devising of appropriate agricultural research programmes. The present study is part of a national survey programme to generate detailed base-line data on smallholder farming systems.

1.13 Since September 1987 AES has conducted a series of farming systems surveys in selected sites throughout the country, such as in the immediate areas of influence of Rural Development Centres or in other areas of special agricultural interest. It is intended that the findings of the survey will find application in the evaluation of development activities, and will assist in the assessment of changes taking place in Solomon Islands agriculture and the formulation of development strategies. The background and justification for the survey programme are documented in the AES Inception Report of 1987<sup>(20)</sup>. Methodologies are described in the Agricultural Economics Field Survey Manual<sup>(21)</sup> and related documents produced by AES.

1.14 The Afio survey in Malaita Province, on the south-western coast between Tawairoi on the main island and Weihii on the island of Maramasike, or Small Malaita, is in the vicinity of the Rural Development Centre at Afio-Rokera. Field work was conducted from March to June 1988 and covered a sample of 40 rural households. Two stage systematic random sampling was guided by the Statistics Office based on equal probability of household selection, with accessibility taken into account in the definition of the sample frame. Villages were listed from the 1986 population census and selected by systematic random sampling. A pre-determined number of households within each village (or cluster of small villages) were then selected by simple random sampling. Maps of the survey area are presented in diagrams 1.4 and 1.5.

1.15 The survey is designed to investigate the structure and dynamics of smallholder crop and management systems. Of particular importance in the socio-economics of smallholder agriculture is the allocation of labour, since few cash inputs are applied and little wage labour is employed.

1.16 All cultivated areas, including cropped and cleared land, are measured by tape and compass to an error tolerance of 5%. Crop areas are computed and checked in the field by programmable calculator. Data are processed in "dBASE III Plus" databases and analysed through "SPSS/PC+". Raw output is transferred to "Lotus 123 vr 2" spreadsheets for tabulation and secondary processing. Text tables are incorporated into "Wordstar Professional r 4" and graphics are edited in "Harvard Presentation Graphics".

1.17 The Agricultural Economics Programme is sponsored under the Rural Services Project of the Ministry of Agriculture and Lands which is co-financed by the Government of Solomon Islands and ADB/IDA/IFAD. Data processing and the presentation of results has been made possible by the generosity of the Government of New Zealand through its Miscellaneous Technical Assistance Programme. This has overcome a primary constraint to work of this kind in the Ministry of Agriculture and Lands through the provision of computing hardware.



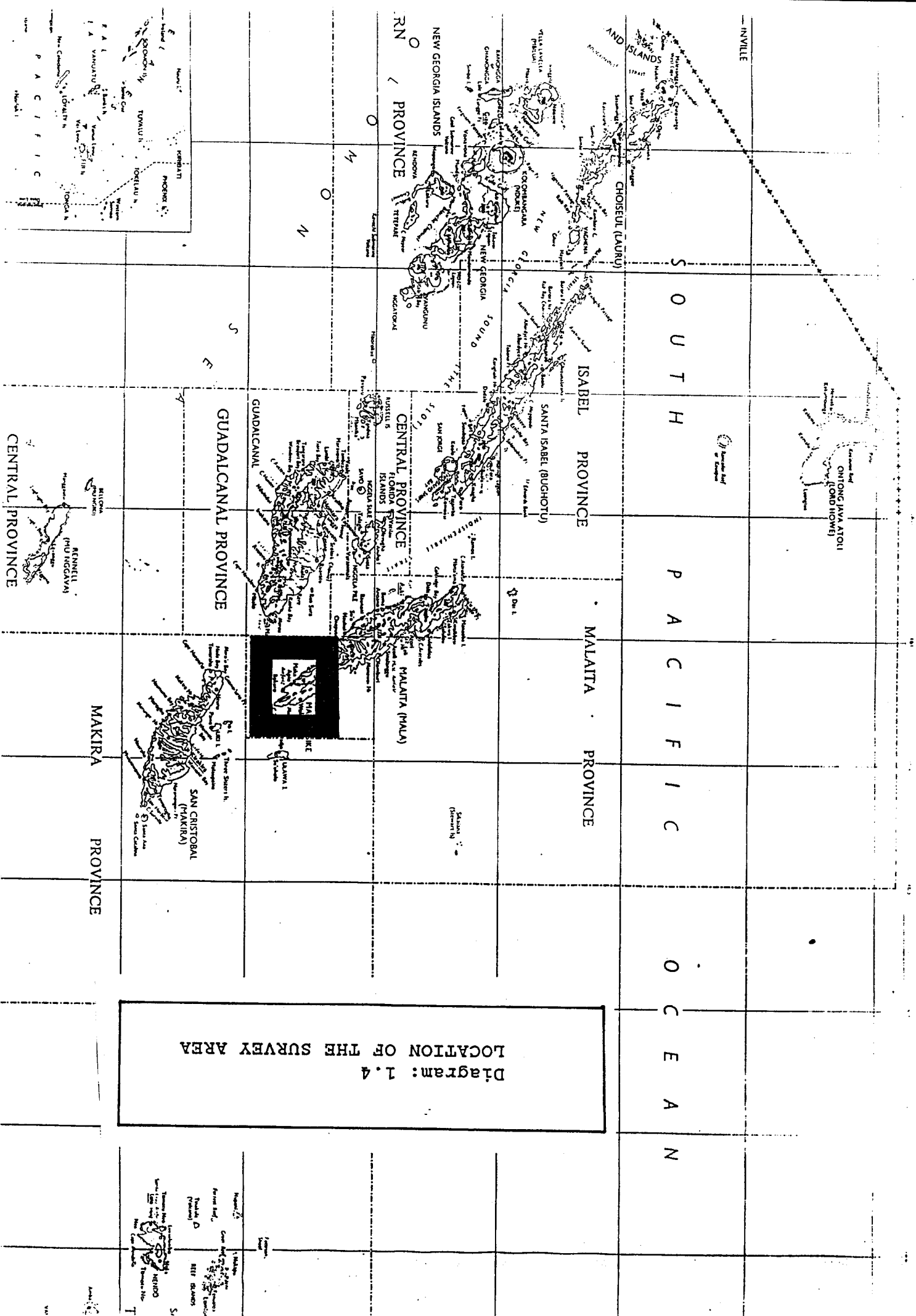
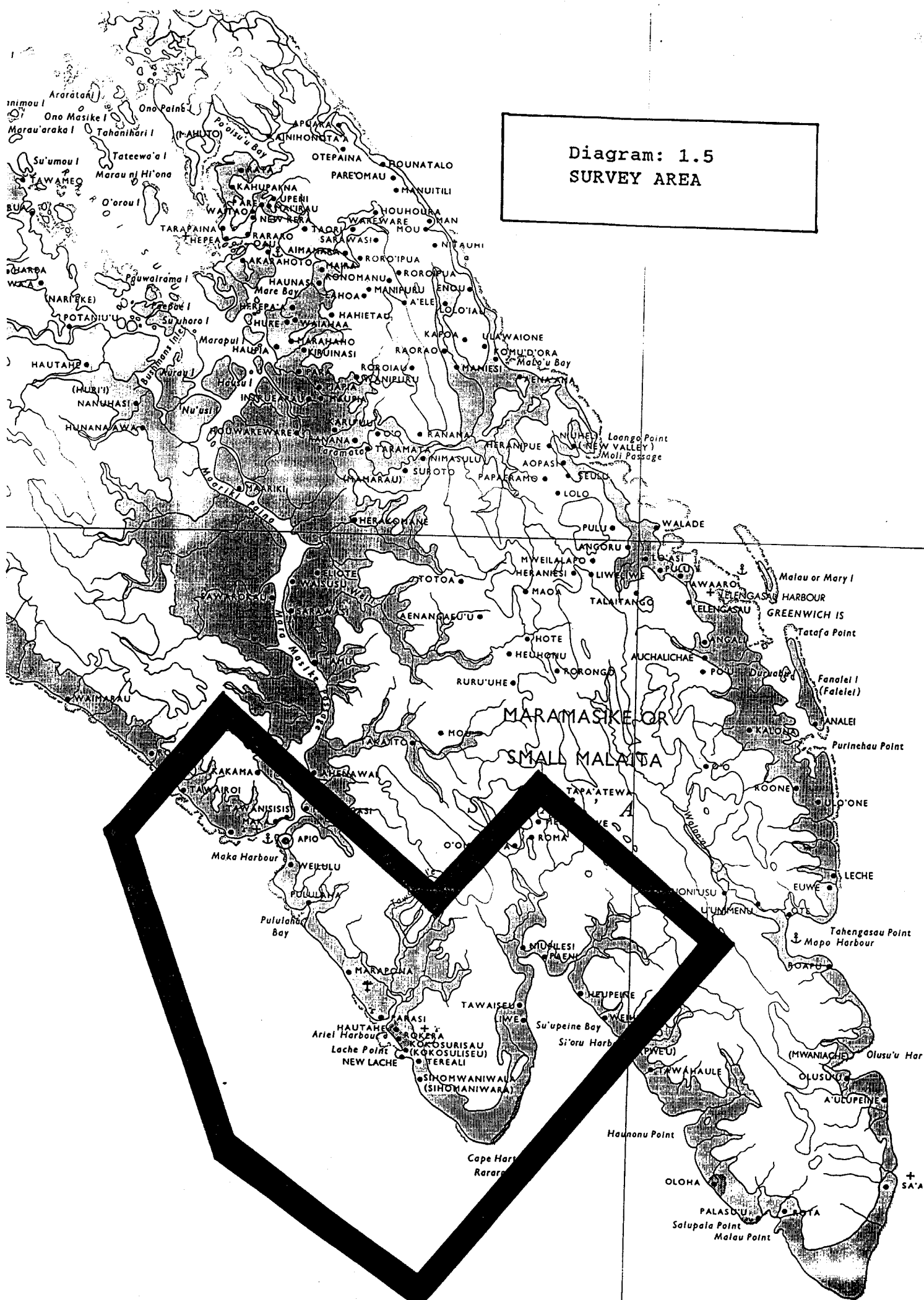


Diagram: 1.5  
SURVEY AREA



## **Chapter: 2**

### **SUMMARY AND MAIN FINDINGS**

#### **Household Composition**

2.1 The mean household size in the survey area is 5.61, comprised of an approximate balance of 2.77 males to 2.84 females.

2.2 In the sample of 40 households the available labour composition of rural households in the survey area is 1.55male:1.79female, or 46% male to 54% female out of a total of 3.34 adult equivalent labour units per household.

#### **Income Earning Activities**

2.3 Income earning activities in the survey area are mainly the sale of food crops, fishing and the sale of coconuts. 35% of sampled households earn income from food crop sales and 5% from livestock sales. Overall 35% of households earn income from fishing, 33% from fish, 8% from shellfish and 10% from crabs.

2.4 18% of households earn income from coconuts, 15% from the sale of nuts and 3% from copra. There is little copra manufacture due to extensive damage to coconuts from Cyclone Namu. No sampled households grow or earn income from cocoa.

2.5 20% of households have a profession, mainly in government service and also in teaching. 15% of sampled households have a business, mainly private shops and also crafts. 13% of households earn income from a skilled trade or traditional craft.

#### **Extension and Mass Media**

2.6 35% of households listen to agricultural programmes on the radio. Simple written materials may be appropriate in extension since 93% of households have at least one member with some reading and writing ability.

2.6 28% of households are visited by agricultural extension workers, whether government or non-government, at least once per year. 32% of farmers have attended a training course or village meetings.

### Livestock

2.7 3% of farmers (1 farmer) own cattle with a herd size of 6 head. Three farmers have a share in a community cattle scheme in which 11 cattle are kept commercially for sale mainly to the Livestock Development Authority.

2.8 Pigs play an important role in the custom and life of rural households. They are kept mainly for ceremonial feasts, weddings and funerals, and other social gatherings. Pigs may be sold for custom money in order to pay a bride price, but may also be sold to pay school fees. 80% of farmers keep pigs with a mean herd size of 3.44 among owners.

2.9 Chickens are kept by 35% of households with a mean flock size of 8.50 among owners. 3% of households keep ducks with a mean flock size of 2.

2.10 One farmer earns income from the sale of crocodile skins. Crocodiles are hunted by spear and the skins cured in salt before sale to Honiara.

### Holding Size Distribution

2.11 The mean holding size in terms of area cultivated is 0.537ha but the holding size distribution is moderately skewed in that 75% of farmers have holdings of less than 0.5ha.

2.12 Inequality in holding size can to a large extent be explained by whether or not farmers have coconuts. Such holdings tend to be larger than non-tree cropping holdings, with a mean size of 1.292ha and represent 33% of farmers. Conversely non-tree cropping farmers have a mean holding size of 0.174ha and represent 67% of sampled farmers.

2.13 All farmers grow traditional subsistence or food crops, where the area cultivated to these crops is fairly uniform among all farmers. The mean food crop area is 0.207ha and the mean tree crop area is 1.015ha.

#### Labour Density

2.14 The mean labour availability is 3.34 adult equivalent labour units per household, resulting in a mean labour density of 6.21 labour units per hectare. There is no apparent association between labour availability and holding size but labour density per unit area falls rapidly from 18.63 labour units per hectare on holdings of less than 0.25ha in size to 1.19 labour units per hectare on holdings of 2.5-3ha in size. On non-tree cropping holdings the mean labour density is 18.24 labour units per hectare compared with 2.85 labour units per hectare on tree-crop holdings. Labour is unlikely to be limiting and there may be under-employment on small holdings.

#### Cropping Patterns

2.15 The average holding size is 0.54ha, however, a distinction is made between farmers with tree crops and those with no tree crops. Of households with tree crops the mean holding size is 1.29ha, of which 1.01ha is under tree crops and 0.28ha is food crops. In contrast non-tree crop farmers have a mean holding size of 0.17ha under food crops. Despite the small size of holdings smallholder cropping patterns are complex and diverse, with 8 dominant crops recorded and a total of 89 distinct mixtures.

#### Coconuts and Cocoa

2.16 In the survey the coconut variety is entirely local tall. 21% are eight years or less in age, 19% all 9-16 years, 31% are 17-40 years and 30% are stands of older than 40 years.

2.17 Maintenance standards in the survey area are moderate, with 7% of plots undercropped and 21% brushed to ground level. 29% are brushed to shoulder height and 43% have a ground cover of secondary bush.

### Fallow

2.18 Fallow in Solomon Islands farming systems is necessary for the maintenance of soil fertility, particularly for the replenishment of potassium in ash following burning. Shifting cultivation has other valuable characteristics, not least its phytosanitary qualities. The fallow period is an indicator of land pressure, and possible fertility and pest problems associated with intensive cultivation. On food gardens where it is known, there is a fallow period of 8 years, but 40% have a fallow longer than memory. Root crops are typically grown over 4 to 6 harvests before reverting to fallow.

2.19 91% of all gardens have a fallow of primary or secondary forest extending over 78% of the cultivated area.

2.20 23% of the current food garden area was cut from primary forest compared with 15% of the tree crop area.

### Landform

2.21 79% of tree crop gardens representing 86% of the tree garden area are on lowland sites. The remainder are on upland, sloping sites.

2.22 Food crop gardens are mainly on upland sites. 41% of food crop gardens representing 38% of the food garden area are on lowland sites. 59% of gardens representing 62% of the food garden area are on upland, often steeply sloping sites.

2.23 The mean slope is 3 degrees. 56% of all plots, representing 80% of the total cultivated area are on sites of less than 5 degrees slope. 15% of the cultivated area is on slopes of 5 to 10 degrees and 5% is on slopes of 20 to 30 degrees.

2.24 No conservation measures or alley cropping are practiced.

2.25 The mean distance of gardens from households is .601 hours, with a maximum recorded distance of 2.05 hours. There is no apparent association between garden size, crop type, and distance of garden from the household.

### Adverse Factors Affecting Production

2.26 52% of gardens representing 23% of the cultivated area have no apparent site limitations. Poor soil and site factors are regarded as constraints on 4% of gardens (5% of area); pests and disease are a problem on 34% of gardens (18% of area); weeds are a problem on 11% of gardens affecting 55% of the cultivated area.

2.27 The dominant problems are weeds on tree gardens and pest and disease on food gardens.

### Crop Yields

2.28 Production data from the farming systems survey need to be reinforced with further yield studies to be undertaken by AES in 1989 and beyond. Indicative yields derived from secondary sources are presented in chapter 14.

2.29 In the survey the following yields were obtained:

#### Yield data from the farming systems survey

	<u># obs</u>	<u>kg/ha</u>
sweet potato	2	3,326
yam	4	9,066
pana	3	8,666
rock mellon	1	6,203

## Labour

2.30 The dominant constraints are on tree crops. A labour shortage is recorded on 47% of the tree crop area, while a shortage of inputs or cash is recorded on 63% of the area. 14% of tree crop gardens, on 8% of the tree crop area, are too far from households. In contrast 6% of food crop gardens on 13% of the food crop area have a shortage of labour, but distance of gardens from households is a problem on 41% of food crop gardens on 37% of the food crop area.

2.31 Labour expenditure on the average holding is summarised in table 2.1 - presented firstly by crop (aggregating all operations), and secondly by operation (aggregating all crops).

Table: 2.1  
LABOUR SUMMARY

	<----- work days per year -----> <----- per holding -----> per ha					<- % contribution ->			labour cost
	men	women	paid	total	average	men	women	paid	(SI\$)
i) By Crop									
Cleared Land									
Coconut	88	72	6	166	542	53	43	4	10
Fruit Crops					502				
Sweet Potato	23	43	1	67	1021	34	64	1	2
Taro					399				
Yam	20	44	1	65	611	31	68	2	1
Pana	2	9		11	548	18	82		
All Crops	133	168	8	309		43	54	3	13
ii) By Operation									
Land Clearance	34	40	3	77		44	52	4	3
Cultivation	30	26	1	57		53	46	2	2
Planting	16	21		37		43	57		
Tree Crops Establishment			3	3				100	2
Tree Crops Maintenance	16	6		22		73	27		
First Weeding	10	22		32		31	69		1
Second Weeding	6	6	1	13		46	46	8	4
Third Weeding	7	5		12		58	42		1
Harvesting	14	42		56		25	75		
All Operations	133	168	8	309		43	54	3	13
Available labour units	:1.55	1.79							
Days per unit labour	: 86	94	8						



2.32 There are 309 work days per year required on an "average" holding of which 133 are provided by men, 168 by women and 8 by paid labour. The average adult man in the household spends 86 days working on the holding and the average adult woman spends 94 days. Overall men provide 43% of labour, women provide 54%, and 3% of the labour budget is accounted for by hired labour at an average annual cost of SI\$13.

2.33 Coconut accounts for 54% of the holding labour budget, mainly in land preparation and planting, as a result of Cyclone Namu damage. Sweet potato accounts for 22%, yam 21% and pana 4%. Overall food crops account for 46% of the annual labour budget.

### Cash Crop Processing

2.34 Little copra is made as a result of Cyclone Namu damage. The labour composition is mainly family with an annual labour expenditure of 32 work days to produce 240kg copra, or one work day per 8kg copra produced. 15 work days are spent on picking and shelling the nuts which account for 47% of the total production time. Firewood collection takes 7 days or 22% of the time and drying, bagging and transport take 6 days or 19% of the total production time.

2.35 From an annual production of 240kg valued at the prevailing price of 33 cents per kilo the gross return is SI\$79. Inputs costs from bags and twine amount to SI\$4.08 and labour costs are SI\$20.00. The net income is SI\$55 which, at a requirement of 27 household labour days, represents a net return to labour of SI\$2.04 per household work day.

2.36 There is no cocoa production among sampled farmers.

### Marketing

2.37 There was no local market and so local crop prices could not be obtained.

2.38 Marketing problems mostly slight, but transport, distance, labour shortage, low prices and risk of not selling enough are all important problems.

## Chapter: 3

### HOUSEHOLD COMPOSITION

3.1 The analysis of household composition in the farming systems survey is to set production and management information in a social context and to establish labour availability. New demographic data are becoming available from the 1986 census and these provide background to survey results. Table 3.1 summarises some early results of the census<sup>(1)</sup>.

Table: 3.1  
POPULATION CHARACTERISTICS  
(from the 1986 census)

Province	Western	Ysabel	Central	Guadal	Honiara	Malaita	Makira	Temotu	Total
1986 population	55,250	14,616	18,457	49,831	30,413	80,032	21,796	14,781	285,176
annual growth rate	3.0	3.2	2.9	4.3	6.8	2.7	3.6	2.8	3.5
% national population	19	5	6	17	11	28	8	5	100
peri-urban population	3,710	1,901	1,622		30,413	3,252	2,588	1,295	44,781
% peri-urban	7	13	9	38		4	12	9	16
males	29,202	7,329	9,850	26,251	17,293	39,605	11,174	7,268	147,972
females	26,048	7,287	8,607	23,580	13,120	40,427	10,622	7,513	137,204
sex-ratio	112	101	114	111	132	98	105	97	108
number of households	7,942	2,362	3,079	8,072	4,317	12,417	3,278	2,375	43,842
household size	6.96	6.19	5.99	6.17	7.04	6.45	6.65	6.22	6.50
Age composition (%)									
0 - 14	46.4	48.8	45.7	46.8	39.2	50.2	50.7	49.6	47.3
15 - 29	27.2	22	26	27.2	35.7	21.7	23.3	23.3	25.8
30 - 44	13.5	13.9	14.4	14	17.1	13.2	13.1	13.3	13.9
45 - 59	8	8.5	8.2	7.3	5.8	9.1	8.2	8.5	8.1
60 +	4.9	6.7	5.7	4.6	2.1	5.7	4.6	5.5	4.9

Source: Statistics Office Statistical Bulletin 3/88

3.2 In November 1986 the population of Solomon Islands was 285,176 with an annual growth rate of 3.5%. The national mean household size was 6.5, resulting in a total of 43,842 households, of which at least 84% are rural. Guadalcanal, Malaita and Western Provinces account for 77% of the national population.

3.3 The age composition of the Solomon Islands population is young with a wide based, tapering population pyramid. The "dependency ratio" (the number of persons under 15 years and over 60 years of age per 100 persons aged 15 to 59 years) is 109<sup>(2)</sup>.

3.4 The total fertility rate is 6.4 children per woman at the end of her child bearing age. The life expectancy at birth among males is 59.9 years, and among females is 61.4 years. Male infant mortality is 40 per thousand live births compared with a female infant mortality of 36 per thousand live births<sup>(2)</sup>.

3.5 In the census 40,046 persons attended school during 1986, although some disruption was caused by Cyclone Namu. Among all persons aged 5 years and over not attending school in 1986, 51% had no education. Primary school attendance spans a wide age range, but 20% of age group 10 to 24 never attended school.

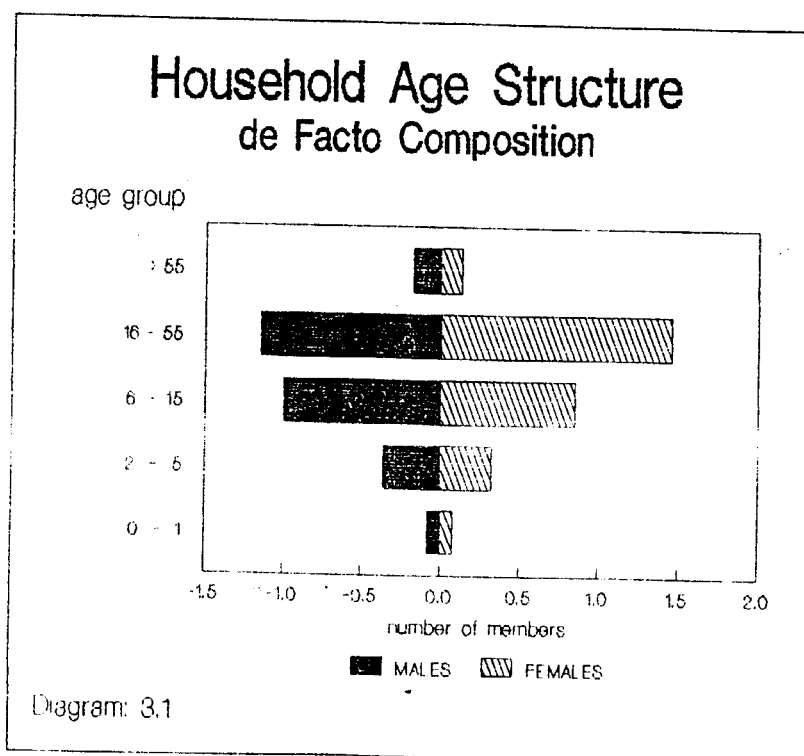
3.6 94.2% of the Solomon Islands population is Melanesian, 3.7% Polynesian and 2.1% other ethnic groups, but mainly Kiribati. 17% of the census population were residing in a province other than that of their birth, indicating a considerable level of internal migration. Onward movement is particularly strong from Malaita, resulting in net out-movement. This is true for provinces other than Central and Guadalcanal which experience a net in-movement. All provinces showed a net movement to Honiara.

3.7 Household composition results from the farming systems survey are summarised in table 3.2. Age categories are chosen to provide approximate conversion into "available labour units". The membership of a household often includes relatives and, less commonly, non-relatives (these are both referred to as "relatives" in the table). Both family and non-family members define the "de facto" household size which is the actual number of people residing in the household, and is illustrated in diagram 3.1. A second measure of household composition is the number of immediate family members (father, mother, sons and daughters) either living at home or living away. This is known as the "de jure" family size.

Table: 3.2  
HOUSEHOLD COMPOSITION

Mean Number of Household Members:

MALE					I	I	FEMALE					
living at HOME					: AWAY	I	living at HOME					: AWAY
					I	AGE GROUP						I
Head :	Family :	Relative :	Family	I			Head :	Family :	Relative :	Family	I	
0.15 :	:	0.03 :		I	> 55	I	0.03 :	0.05 :	0.05 :			
0.65 :	0.40 :	0.10 :	0.23	I	16 - 55	I	0.18 :	1.18 :	0.10 :	0.18		
	0.80 :	0.20 :	0.18	I	6 - 15	I		0.80 :	0.05 :	0.03		
	0.28 :	0.08 :	0.03	I	2 - 5	I		0.32 :				
	0.08 :	:		I	0 - 1	I		0.08 :	:			
Category total:	0.80	1.56	0.41	0.44			0.21	2.43	0.20	0.21	6.26	
Family at home:		2.36						2.64			5.00	
De Facto total:			2.77						2.84		5.61	
De Jure total :				2.80						2.85	5.65	



3.8 In the survey area the average family size is 5.65. With 11% of family members living away from home, a household has on average 5.61 members, of which 5.00 are immediate family and the remainder relatives or others residing in the household. Of those living away 0.41 are in the economically active age group 16 - 55 and 0.24 are younger than 15 . Of 2.80 male family members 2.36 live at home, representing a net onward movement of 15% among male family members. This is not entirely compensated for by non-family male household members, since there are 2.77 males in the household.

3.9 Of 2.85 female family members 2.64 live at home, representing an onward movement of 7% . This is compensated for by additional non-family female members living in the household since there are 2.84 female members of the household.

3.10 There is then a 1% net out movement of males and no net movement of females. This results in a household gender composition of 2.77 male household members to 2.84 females, a ratio of 1:1.03 males to females.

3.11 Household composition is converted into "adult equivalent labour units" in table 3.3 according to factors employed by Bathgate<sup>(18)</sup> (although there are slight differences in age classes between the two studies). An average household of 3.34 labour units is made up of 1.55 male units and 1.79 female units, an approximate balance of 46% male and 54% female labour.

Table: 3.3  
HOUSEHOLD LABOUR AVAILABILITY

Mean number of members by age group:

<----- MALES ----->			I	AGE	I	<----- FEMALES ----->			<----- TOTAL ----->		
de Jure	de Facto	labour	I	GROUP	I	de Jure	de Facto	labour	de Jure	de Facto	labour
			I		I						
0.15	0.18	0.10	I	> 55	I	0.08	0.13	0.08	0.23	0.31	0.18
1.28	1.15	1.15	I	16 - 55	I	1.54	1.46	1.45	2.82	2.61	2.60
0.98	1.00	0.30	I	6 - 15	I	0.83	0.85	0.26	1.81	1.85	0.56
0.31	0.36		I	2 - 5	I	0.32	0.32		0.63	0.68	
0.08	0.08		I	0 - 1	I	0.08	0.08		0.16	0.16	

Total	2.80	2.77	1.55			2.85	2.84	1.79	5.65	5.61	3.34
-------	------	------	------	--	--	------	------	------	------	------	------

Labour availability assumes the following conversion factors:

age class	factor
> 55	0.6
16 - 55	1.0
6 - 15	0.3
0 - 5	0.0

## Chapter: 4

### INCOME EARNING ACTIVITIES

4.1 2.5% of rural households in the country were enumerated in the 1982 Household Income and Expenditure Survey <sup>(3)</sup> conducted by the Statistics Office of the Ministry of Finance. Virtually all rural households had food gardens. 39% sold copra and 41% sold garden produce, with an average monthly income from sales of S\$ 56. A summary of income earning activities according to the 1982 survey compared with the 1986 population census is presented in table 4.1.

Table: 4.1

1982 INCOME AND EXPENDITURE SURVEY: SALES

activity	% households earning income	
	1982	1986
copra	39	29
coconut	18	
cocoa	0.38	9
betel nut	1.25	17
other cash crop	12	
garden produce	41	34
cattle		2
pigs		12
poultry		10
fish	24	17
crabs, lobster		4
beche de mer		12
shells	7	
carvings	4	
hand crafts	0.38	4
canoes		3
mats, baskets		10
thatch		4
houses		5
other sales	1.13	

Source: Statistics Office National Accounts Discussion Document No 2  
Statistics Office Bulletin 12/88

4.2 These figures show the importance of garden produce sales as an income earning activity, although the relative magnitude of earnings is not known. Copra is the major cash earning commodity, showing an apparent contraction in the proportion of rural sales. Cocoa sales have, in contrast, expanded.

4.3 In the 1982 survey 27% of rural households had at least one member in paid employment, from which the average monthly wage was SI\$103. 16% had their own business and 39% of households had a share in a cooperative (although it is stated that this result should be treated with caution). 10% of households held a loan, with an average monthly repayment of SI\$87, the majority with the Development Bank of Solomon Islands.

4.4 On average a household spent SI\$57 per month on goods and services of which 47%, or SI\$27, was on food. Less frequent expenditures amounted to SI\$5 per month.

4.5 Reported (cash and non-cash) income was SI\$147 compared to monthly expenditures of SI\$131. The average cash component of income amounted to SI\$86 per month compared with expenditures of SI\$74. The excess of 17% in income over expenditure was believed to be due to the underestimation of production costs rather than the true value of rural savings.

4.6 The 1986 census <sup>(2)</sup> found that 25% of the population aged 14 years and over was working for money (the week before the census enumeration), and about half of those also performed village work such as track clearing and church construction. About 80% of those not engaged in cash employment performed village work.

4.7 35% of males were engaged in cash employment compared with 13% of females. The 1982 Household Income and expenditure survey also states that "generally boys had a better chance of attending school than girls".

4.8 The rural economy is diverse, with a variety of farm and off-farm activities which contribute to household income. Results from the farming systems survey are presented in table 4.2. The table describes the proportion of households undertaking income earning activities in the survey area. Rural income and expenditure patterns are covered by other (non AES) surveys - planned or recently undertaken - and so the present survey does not investigate the relative importance of activities undertaken



in terms of income earned, except in Chapter 19 on marketing.

Table: 4.2

# INCOME EARNING ACTIVITIES

	(<---- % households ----> by activity		
	individual	group	summary of individual activities
Households Earning Income Over the Past Year From:			
COCONUTS			
Coconuts .....	15	15	+++++++
Copra .....	3	3	+
Coconuts and Copra .....			
Total	18		
COCOA			
Wet beans .....			
Green Beans .....			
Green and Dry Beans .....			
Total			
OTHER CROPS			
Food Crops .....	33	35	+++++
Other Cash Crops .....			
Food and Cash Crops .....			
Livestock .....	3	5	+
Food crops and Livestock .....	3		+
Cash Crops and Livestock .....			
Food, Cash Crops and Livestock			
Total	38		
FISHING			
Fish .....	25	33	+++++
Shellfish .....		8	
Fish and shellfish .....			
Crabs, etc .....		10	
Fish and Crabs .....	3		+
Shellfish and Crabs .....	3		+
Fish, Shellfish and Crabs ....	5		++
Total	35		
LOGGING/MINING			
Logging .....			
Sawmill .....			
Logging and Sawmill .....			
Mining .....			
Logging and Mining .....			
Sawmill and Mining .....			
Logging, Sawmill and Mining ..			
Total			

# INCOME EARNING ACTIVITIES (continued)

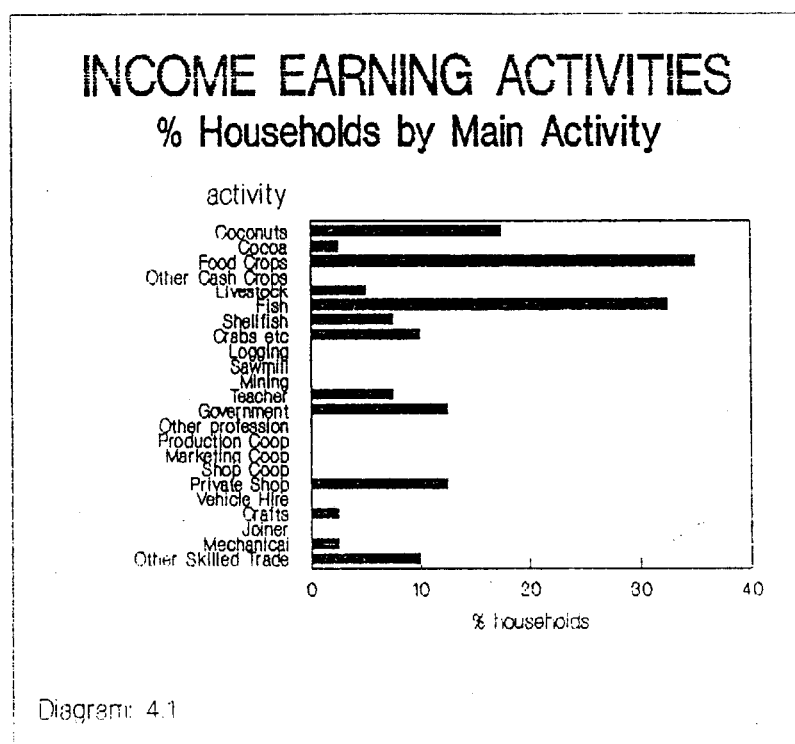
	<---- % households ----> by activity		
	individual	group	summary of individual activities
PROFESSION			
Teacher .....	8	8	+++
Government Employee .....	13	13	+++++
Other Profession .....			
Total	20		
COOPERATIVE			
Crop Production Cooperative ..			
Marketing Cooperative .....			
Crop and Marketing .....			
Cooperative Shop .....			
Crop and Shop .....			
Marketing and Shop .....			
Crop, Marketing and Shop .....			
Total			
BUSINESS			
Private shop .....	13	13	+++++
Vehicle Hire .....			
Shop and Vehicle .....			
Crafts .....	3	3	+
Shop and Crafts .....			
Vehicle and Crafts .....			
Shop, Vehicle and Crafts .....			
Total	15		
SKILLED TRADE			
Joiner/housebuilder .....			
Mechanical Trade .....	3	3	+
Joiner and Mechanical .....			
Other Skilled Trade .....	10	10	+++++
Joiner and Other .....			
Mechanical and Other .....			
Joiner, Mechanical and Other .			
Total	13		

Note: "Other Skilled Trades" are: Making shell money  
paddles, canoes  
baskets

4.9 In the table are two columns, entitled "individual" and "group". Individual activities distinguish between combinations of activities - treating for instance "food crops" (only), "livestock" (only) and both "food crops and livestock" as three distinct activities. The percentages of households for individual activities are additive, and are shown as a "total" for each set of related activities in the table.

4.10 Under group activities - all occurrences of "food crops" and all occurrences of "livestock" are summarised under the two main headings, since "livestock" and "food crops and livestock" are both livestock activities. "Group" activities represent an alternative summary for the data set, and are non additive.

4.11 To the right of table 4.2 is a histogram summary of individual activities. Diagram 4.1 provides a visual summary of grouped activities.



4.12 Income earning activities in the survey area are mainly the sale of food crops, fishing and the sale of coconuts rather than copra. 35% of sampled households earn income from food crop sales and 5% from livestock sales. Overall 35% of households earn income from fishing, 33% from fish, 8% from shellfish and 10% from crabs.

4.13 18% of households earn income from coconuts, 15% from the sale of nuts and 3% from copra. There is little copra manufacture due to extensive damage to coconuts from Cyclone Namu. No households earn income from cocoa.

4.14 20% of households have a profession, mainly in government service and also in teaching. 15% of sampled households have a business, mainly private shops and also crafts. 13% of households earn income from a skilled trade or traditional craft.

## Chapter: 5

### EXTENSION AND MASS MEDIA

5.1 Table 5.1 summarises the penetration of mass media and extension in the survey area.

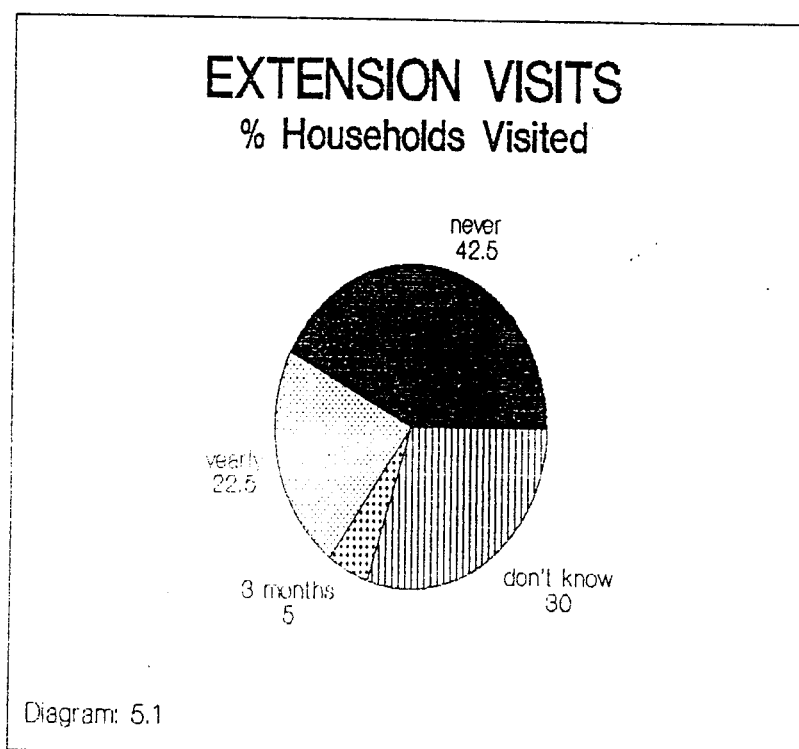
Table: 5.1  
EXTENSION AND MASS MEDIA

	% households	summary
i) Households Listening to Agricultural Programmes on the Radio:		
Never listen .....	65	+++++
Listen weekly .....	25	+++++
" monthly .....	10	++
" occasionally .....		
Total	100	
ii) Households with Members who can Read and Write:		
Not able to read or write .....	8	+
Able to read .....		
" write .....		
" read and write .....	93	+++++
	100	
iii) Households Visited by (any type of) Extension Worker:		
Never been visited .....	43	+++++
Visited very occasionally .....		
" once per year .....	23	+++++
" " 6 months .....		
" " 3 months .....	5	+
" " month .....		
" " week .....		
Don't know .....	30	+++++
	100	
iv) Households in which Members have Attended Training:		
Never attended training .....	68	+++++
Attended village meeting .....	10	++
" day course at training centre .....	18	++++
" village meeting and day course .....	3	.
" residential course .....	3	.
" village meeting and residential course .....		
" day and residential course .....		
" village meeting, day and residential course ...		
	100	

5.2 Travel and communication are difficult in Solomon Islands, with scattered islands of low population densities. Radio offers a means of transmitting information throughout the country, albeit one-way, and in a medium which makes few demands on literacy. In the survey 35% of households listen to agricultural programmes on the radio. The communication of agricultural and other development information by radio may be extended further by word of mouth.

5.3 The second part of the table shows the proportion of households in which at least one member is able to read or write. According to these results 93% of households have at least one member with some reading and writing skills. The survey was unable to verify the level of skills or to substantiate this finding objectively, but the result suggests that simple written materials are an appropriate extension medium. In more general terms, pictorial materials would be popular together with simple text and annotation.

5.4 The frequency of extension visits is investigated in the third part of the table, and is illustrated in diagram 5.1.



5.5 Extension in the present study refers to any agricultural worker in government extension, research, NGOs or other organisations. 28% of households are visited at least once per year and 32% have received some form of agricultural training, mainly in the form of village meetings and day courses.

## Chapter: 6

### LIVESTOCK

6.1 Livestock, particularly small stock such as pigs and chickens, are an important feature of smallholder agriculture in Solomon Islands.

6.2 The number of cattle in the 1985 census was 19,750 - a fall of 13.1% from 1984 due largely to destocking in the plantation sector. Overall the national herd was 22% below its peak of 1978, with an average annual fall of 3.4%<sup>(4)</sup>.

6.3 The smallholder sector accounted for 7,612 cattle, 39% of the national herd, showing a decline of 4.1% from the 1984 census. The distribution of cattle throughout the country is shown in table 6.1.

Table: 6.1  
CATTLE DISTRIBUTION IN 1985

Province	total cattle	% distribution
Western	4,841	25
Ysabel	1,110	6
Central	2,081	10
Guadalcanal	6,292	32
Malaita	3,810	19
Makira	1,462	7
Tenotu	217	1
Total	19,750	100

Source: Statistics Office, 1985 Cattle Census

6.4 In the 1982 Income and Expenditure Survey<sup>(3)</sup> it was found that 37% of households owned pigs, 30% owned chickens, but only 8% owned cattle. The provincial breakdown is shown in table 6.2.

6.5 According to the 1986 Population Census<sup>(2)</sup> 2% of households earned income from cattle, 12% earned income from pigs and 10% earned income from poultry.



Table: 6.2  
LIVESTOCK DISTRIBUTION IN 1982

Province	% households owning		
	cattle	pigs	chickens
Western	2	19	24
Ysabel	42	25	47
Central		28	7
Guadalcanal	2	63	41
Malaita	9	35	28
Makira	10	69	63
Temotu		40	4
Total	8	37	30

Source: Statistics Office, 1982 HH Income and Expenditure Survey

6.6 5% of households earned income from livestock (table 4.2) sales, which in this case refers to the sale of cattle only.

6.7 Table 6.3 summarises livestock ownership in the survey area, and is divided into three columns. The first, entitled "ownership %", specifies the percentage of households which own livestock. The middle two columns show mean stock held: firstly among livestock owning households (owners); and secondly as an average of all farmers in the survey area (both owners and non-owners). To the right of the table is a histogram summary of ownership based on the mean among all farmers.

6.8 The table is divided horizontally into three main parts. The first part specifies stock numbers kept predominantly for home use, but which may include occasional sales. The second part specifies stock numbers where livestock comprise an income earning enterprise. The third part is the overall mean of livestock ownership irrespective of type of enterprise. (Note that overall mean ownership figures are derived from the original data and may not be obtained from summation of the table entries above).

6.9 At the foot of the table is a component on novel livestock enterprises, such as bees, butterflies and crocodile farming.

Table: 6.3  
LIVESTOCK

Livestock Ownership:

	ownership %	<-- mean ownership among --> owners all farmers		summary all farmers
i) Home Use				
Cattle .....	3	6.00	0.15	.
Pigs .....	80	3.44	2.76	+++++++
Goats .....				
Chickens .....	35	8.50	2.97	+++++++
Ducks .....	3	2.00	0.05	.
Horses .....				
ii) Commercial				
Cattle (community) .....	8	11.00	0.83	+++
Pigs .....				
Goats .....				
Chickens .....				
Ducks .....				
Horses .....				
iii) Total				
Cattle .....	3	6.00	0.15	++++
Pigs .....	80	3.44	2.75	+++++++
Goats .....				
Chickens .....	35	8.50	2.97	+++++++
Ducks .....	3	2.00	0.05	.
Horses .....				
iv) Households Earning Income				
	<---- % households ----> by activity			
	individual	group		
Income from:				
1. Bees or honey .....				
2. Butterflies .....				
3. Bees and Butterflies .....				
4. Crocodiles .....	2.50	2.50		+++++
5. Bees and crocodiles .....				
6. Butterflies and crocodiles .....				
7. Bees, butterflies and crocodiles ..				

6.10 3% of farmers (1 farmer) own cattle with a herd size of 6 head. The herd is allowed to free range and so does not enter into cropping patterns. Three farmers have a share in a community cattle scheme in which 11 cattle are kept commercially for sale mainly to the Livestock Development Authority. Community cattle are kept in fenced pastures, commonly under coconuts, which may be sown with Batiki Blue, Koronavia or Paragrass. Again these do not enter into cropping patterns.

6.11 Cows with calf are generally kept on the best pastures. Male calves are castrated at three months to prevent in-breeding and calves are also de-horned. Buffalo flies are a problem requiring the spraying of cattle with Ethion. Smallholders are generally concerned with fattening although the Catholic Mission at Rokera also breeds cattle. On special occasions cattle may be slaughtered for a feast, such as for the inauguration of a church. Cattle are generally sold through the Livestock Development Authority but some local sales take place.

6.12 Pigs play an important role in the custom and life of rural households. They are kept mainly for ceremonial feasts, weddings and funerals, and other social gatherings. Pigs may be sold for custom money in order to pay a bride price, but may also be sold to pay school fees.

6.13 80% of farmers keep pigs with a mean herd size of 3.44 among owners.

6.13 Pigs are generally either fenced or tethered. Fences are commonly made of wire, wood or stone and a shelter is built inside the enclosure. Pigs inside will be fed in the morning and evening and watered where necessary. Tethered pigs are generally kept under the house at night and will be led to the bush to forage during the day.

6.14 Pigs will be fed with any root crop, fruits and leaves, and sometimes the scraps of fish and coconut.

6.15 Chickens and ducks are largely kept for food and are especially important at Christmas time and at birthdays. They are allowed to free range, requiring minimal management but also suffer from predation by animals such as dogs and wild hawks.

6.16 Chickens are kept by 35% of households with a mean flock size of 8.50 among owners. 3% of households keep ducks with a mean flock size of 2.

6.17 One farmer earns income from the sale of crocodile skins. Crocodiles are hunted by spear and the skins cured in salt before sale to Honiara.

## Chapter: 7

### HOLDING SIZE DISTRIBUTION

7.1 Holding size distribution is of interest because it provides an understanding of the structure of agriculture and may help to explain constraints faced by farmers or response to services.

7.2 Table 7.1.i describes the holding size distribution of the survey area. While holdings are in general small, a high proportion of farmers have very small areas. With a mean holding size of 0.537ha, 75% of farmers have holdings less than 0.5ha. This can be seen in diagram 7.1 which shows that all holdings are small but a high proportion of farmers fall in the very low holding size classes.

7.3 The mean describes the "average" holding size and is of interest in that it provides a value for the "middle" of the data based on the spread of values, but it may be misleading when unbalanced extreme values occur. Another measure of central tendency is the median which is the "mid-point" in the data, the value of the middle item when the data are arranged in order. In a "normal distribution" the median and the mean coincide. The median in this case is 0.219ha which is not very far removed from the mean holding size, but indicates that the majority of holdings are appreciably smaller than the mean.

7.4 An indicator of variability is the range, which is derived from extremes in the data. The minimum area is 0.036ha and the maximum is 2.521ha, a range of 2.485ha.

7.5 The standard deviation is a measure of variation based on the extent to which values deviate from the mean. If the data are closely bunched the standard deviation is small, and if they are widely spread it is large. In a normal distribution 68% of values lie within 1 standard deviation on either side of the mean, and 95% within 2 standard deviations. In the survey results the mean of 0.537ha has a standard deviation of 0.682 and a coefficient of variation of 127% (the standard deviation expressed as a percentage of the mean).

7.6 Skewness is an index of symmetry in the data. A normal distribution is symmetrical about the mean, with a skewness coefficient of zero, whereas a skewed distribution has a longer "tail" on one side than the other. The present data have a skewness of 1.833 indicating only slightly positive skewness.

7.7 Kurtosis is the extent to which the data cluster around a central point. When this occurs the distribution appears "peaked". Positive values of kurtosis indicate that the distribution is more peaked than normal. In the present data set the coefficient of kurtosis is low, being 2.288.

7.8 The indications are that there is no great inequality in holding size distribution, which may be viewed in standard form in diagram 7.2. The diagonal represents the holding size distribution for equality and the curve below represents the actual (cumulative) holding size distribution. The area between the diagonal and the curve is the "area of inequality". The larger the area of inequality, the more unequal the holding size distribution. This may be expressed as an index, called the "Gini coefficient", which is the area between the two lines expressed as a proportion of the area of the triangle below the diagonal. The Gini coefficient ranges from 0 (for perfect equality) to 1 (for perfect inequality). The Gini coefficient here is 0.55, indicating a moderate degree of inequality.

Table: 7.1  
HOLDING SIZE DISTRIBUTION

i) All holdings and all crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	<----- % ----->		<-- cumulative % -->	
				holdings	area	holdings	area
0 - .25	23	0.1498	3.45	58	16	58	16
.25 - .5	7	0.3522	2.47	18	11	75	28
.5 - .75						75	28
.75 - 1	3	0.8422	2.53	8	12	83	39
1 - 1.25	1	1.0494	1.05	3	5	85	44
1.25 - 1.5	1	1.3642	1.36	3	6	88	51
1.5 - 1.75	1	1.6794	1.68	3	8	90	58
1.75 - 2	1	1.9154	1.92	3	9	93	67
2 - 2.5	2	2.2569	4.51	5	21	98	88
2.5 - 3	1	2.5209	2.52	3	12	100	100
3 - 5						100	100
5 - 10						100	100
10 - highest						100	100
Total	40	0.5370	21.48	100	100		
Mean	0.537			S.E. Mean		0.108	
Median	0.219			Coef. of Var %		127	
Std Dev	0.682			Variance		0.465	
Kurtosis	2.288			S.E. Kurtosis		0.733	
Skewness	1.833			S.E. Skewness		0.374	
Range	2.485			Minimum		0.036	
Maximum	2.521			Sum		21.481	
Gini	0.553						

Note that the main table is a frequency distribution of grouped intervals, while the statistics at the foot of the table describe the ungrouped data set.

# HOLDING SIZE DISTRIBUTION

all holdings - all crops

holding size (ha)

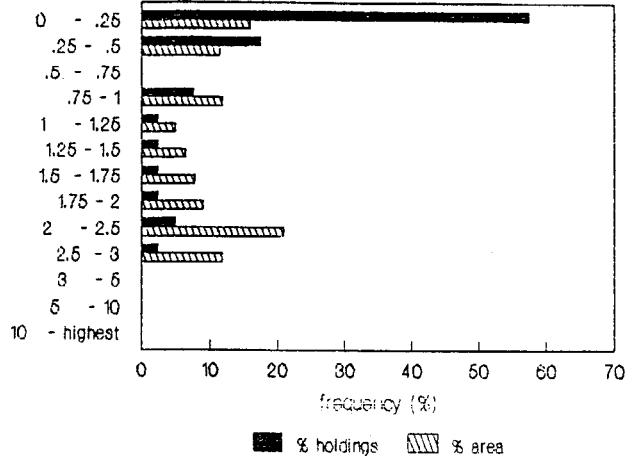


Diagram: 7.1

# LORENZ CURVE

all holdings - all crops

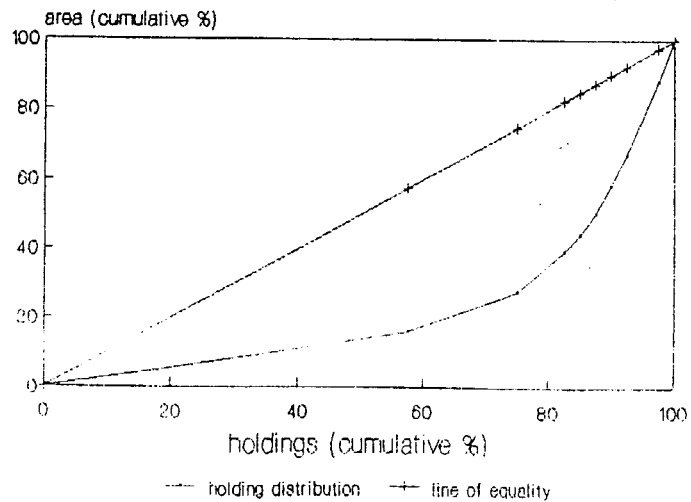


Diagram: 7.2



7.9 Table 8.1.ii shows the holding size distribution of only those farmers who have tree crops. The sample is reduced from 40 to 13, and so the stratum of farmers with tree crops represents 33% of all farmers in the sample.

7.10 The mean holding size among tree cropping farmers is 1.292ha and the median is 1.049ha. The coefficient of skewness has dropped to 0.347 and kurtosis is slightly negative. The range remains wide, but the majority of small holdings are excluded so that the distribution is less scattered, with a coefficient of variation of 59%.

ii) Holdings with tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	<----- % -----> holdings	<----- % -----> area	<-- cumulative % --> holdings	<-- cumulative % --> area
0 - .25	1	0.2455	0.25	8	1	8	1
.25 - .5	2	0.4888	0.98	15	6	23	7
.5 - .75						23	7
.75 - 1	3	0.8422	2.53	23	15	46	22
1 - 1.25	1	1.0494	1.05	8	6	54	29
1.25 - 1.5	1	1.3642	1.36	8	8	62	37
1.5 - 1.75	1	1.6794	1.68	8	10	69	47
1.75 - 2	1	1.9154	1.92	8	11	77	58
2 - 2.5	2	2.2569	4.51	15	27	92	85
2.5 - 3	1	2.5209	2.52	8	15	100	100
3 - 5						100	100
5 - 10						100	100
10 - highest						100	100
<hr/>							
Total	13	1.2918	16.79	100	100		
<hr/>							

Mean	1.292	S.E. Mean	0.212
Median	1.049	Coef. of Var %	59
Std Dev	0.764	Variance	0.584
Kurtosis	-1.282	S.E. Kurtosis	1.191
Skewness	0.347	S.E. Skewness	0.616
Range	2.275	Minimum	0.246
Maximum	2.521	Sum	16.793
Gini	0.320		

7.11 The new distribution of farmers with tree crops is illustrated in diagram 7.3, and its associated Lorenz curve in diagram 7.4. Inequalities have been reduced and the holding size distribution is more "normal" with a Gini coefficient of 0.320.

# HOLDING SIZE DISTRIBUTION

## holdings with tree crops

holding size (ha)

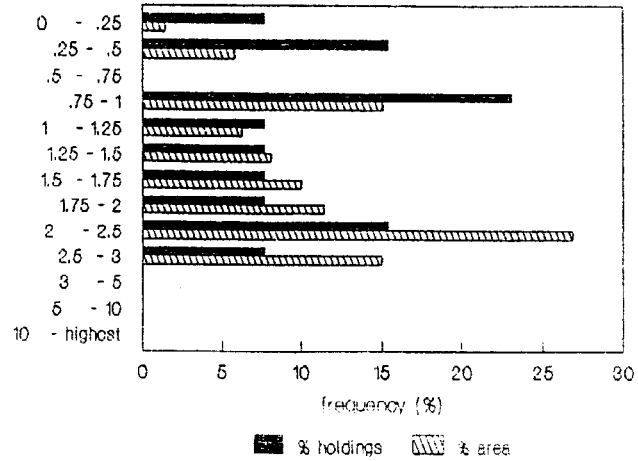


Diagram: 7.2

# LORENZ CURVE

## holdings with tree crops

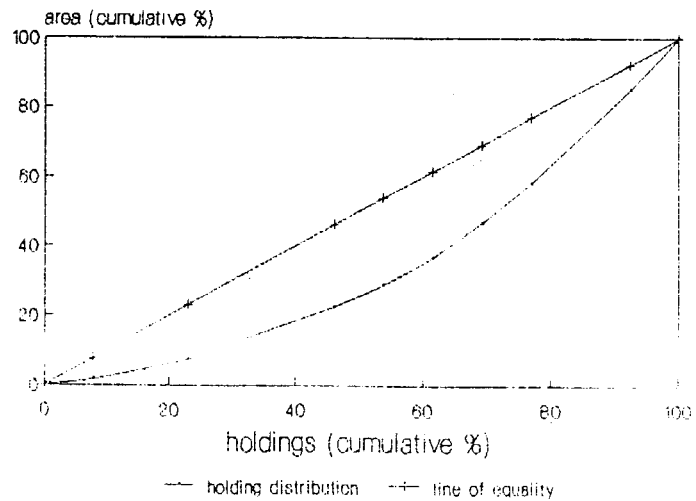


Diagram: 7.4

7.12 The corresponding stratum of farmers with no tree crops is shown in table 7.1.iii. 27 farmers, or 67% of the sample have no tree crops. The mean holding size is 0.174ha and the median is 0.171. The range is small, skewness has dropped to 0.264 and kurtosis is slightly negative. The distribution is more "normal", with a coefficient of variation of 47%.

7.13 The holding size distribution is illustrated in diagram 7.5, and its associated Lorenz curve in diagram 7.6. Inequality is low with a Gini coefficient of 0.231.

iii) Holdings without tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	<----- % -----> holdings                  area		<-- cumulative % --> holdings                  area	
0 - .1	6	0.0679	0.41	22	9	22	9
.1 - .2	13	0.1630	2.12	48	45	70	54
.2 - .3	6	0.2493	1.50	22	32	93	86
.3 - .4	2	0.3324	0.66	7	14	100	100
.4 - .5						100	100
.5 - .6						100	100
.6 - .7						100	100
.7 - .8						100	100
.8 - .9						100	100
.9 - 1						100	100
1 - 1.5						100	100
1.5 - 2						100	100
2 - highest						100	100
Total	27	0.1736	4.69	100	100		

Mean	0.174	S.E. Mean	0.016
Median	0.171	Coef. of Var %	47
Std Dev	0.081	Variance	0.007
Kurtosis	-0.422	S.E. Kurtosis	0.872
Skewness	0.264	S.E. Skewness	0.448
Range	0.297	Minimum	0.036
Maximum	0.333	Sum	4.687
Gini	0.231		

Note the smaller size classes in this table with respect to previous tables.

# HOLDING SIZE DISTRIBUTION

holdings without tree crops

holding size (ha)

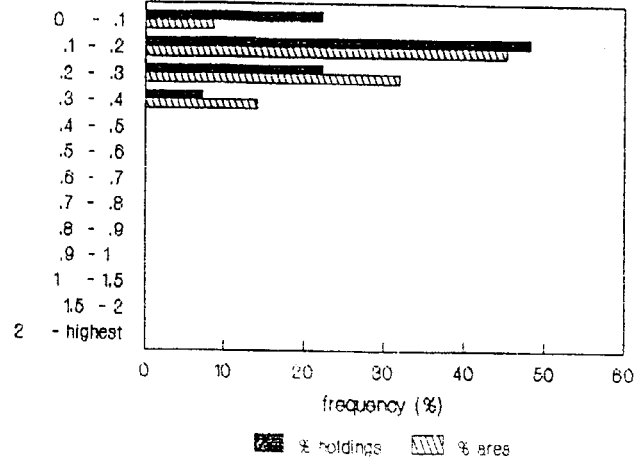


Diagram: 7.5

# LORENZ CURVE

holdings without tree crops

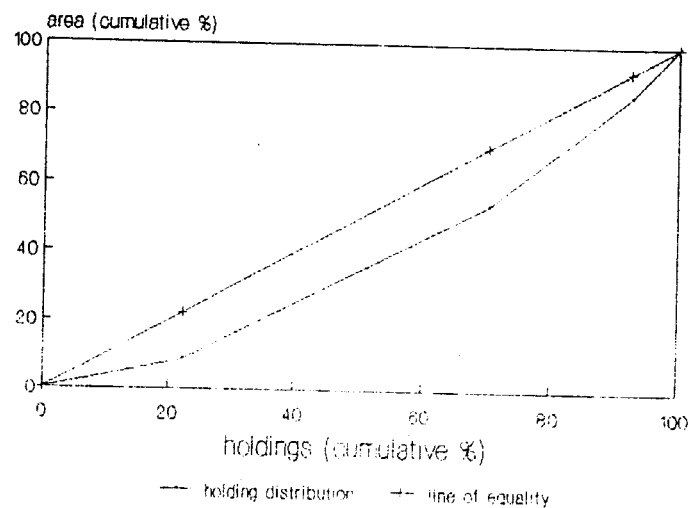


Diagram: 7.6

7.14 Table 7.1.iv describes the holding size distribution of all farmers, but excluding tree crop areas. The holding size distribution is illustrated in diagrams 7.7 and 7.8. These results are similar to those for non-tree crop farmers, indicating that subsistence cropping is similar among all farmers with a mean area of 0.207ha.

iv) All holdings - total area excluding tree crops

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	<----- % ----->			
				holdings	area	holdings	area
0 - .1	7	0.0679	0.48	18	6	18	6
.1 - .2	16	0.1592	2.55	40	31	58	36
.2 - .3	10	0.2431	2.43	25	29	83	66
.3 - .4	4	0.3242	1.30	10	16	93	81
.4 - .5	1	0.4544	0.45	1	5	98	87
.5 - .6	2	0.5420	1.09	5	10	100	100
.6 - .7						100	100
.7 - .8						100	100
.8 - .9						100	100
.9 - 1						100	100
1 - 1.5						100	100
1.5 - 2						100	100
2 - highest						100	100
Total	40	0.2072	8.29	100	100		

Mean	0.207	S.E. Mean	0.019
Median	0.188	Coef. of Var %	57
Std Dev	0.119	Variance	0.014
Kurtosis	1.775	S.E. Kurtosis	0.733
Skewness	1.210	S.E. Skewness	0.374
Range	0.516	Minimum	0.036
Maximum	0.552	Sum	8.290
Gini	0.283		

## HOLDING SIZE DISTRIBUTION

all holdings excluding tree crops

holding size (ha)

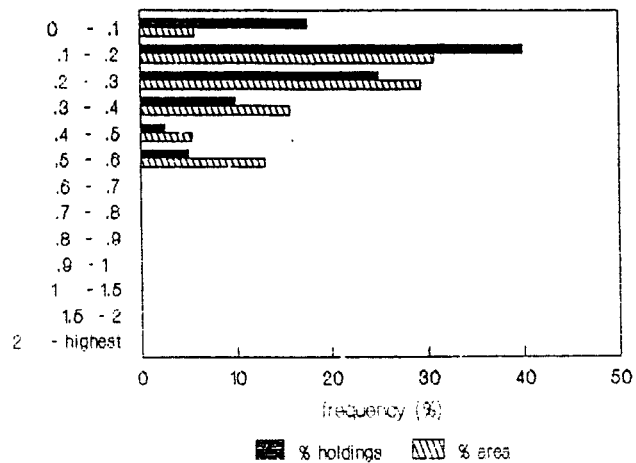


Diagram: 7.7

## LORENZ CURVE

all holdings excluding tree crops

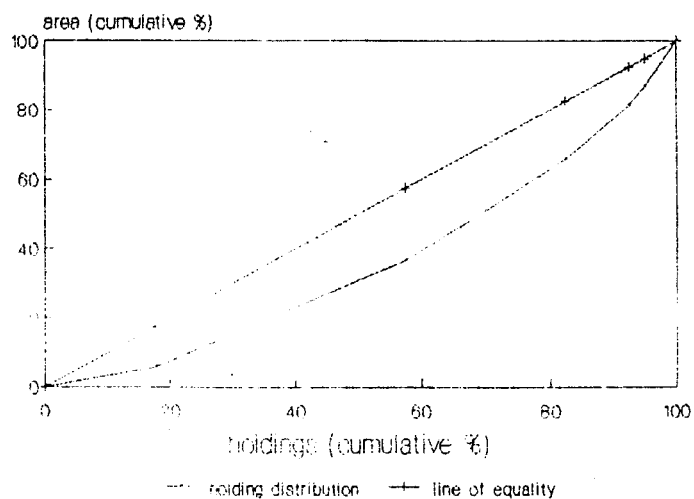


Diagram: 7.8

7.15 Table 7.1.v describes the size distribution of tree crop areas, illustrated in diagrams 7.9 and 7.10.

v) All holdings - total area of tree crops only

holding size (ha)	number of holdings	mean area in class (ha)	total area in size class (ha)	<----- % ----->		<-- cumulative % -->	
				holdings	area	holdings	area
0 - .25	1	0.1770	0.18	8	1	8	1
.25 - .5	2	0.3564	0.71	15	5	23	7
.5 - .75	4	0.5895	2.36	31	18	54	25
.75 - 1	1	0.8127	0.81	8	6	62	31
1 - 1.25						62	31
1.25 - 1.5	2	1.3961	2.79	15	21	77	52
1.5 - 1.75						77	52
1.75 - 2	1	1.8981	1.90	8	14	85	66
2 - 2.5	2	2.2197	4.44	15	34	100	100
2.5 - 3						100	100
3 - 5						100	100
5 - 10						100	100
10 - highest						100	100
<hr/>							
Total	13	1.0146	13.19	100	100		
<hr/>							

Mean	1.015	S.E. Mean	0.201
Median	0.669	Coef. of Var %	72
Std Dev	0.726	Variance	0.527
Kurtosis	-1.002	S.E. Kurtosis	1.191
Skewness	0.725	S.E. Skewness	0.616
Range	2.046	Minimum	0.177
Maximum	2.223	Sum	13.190
Gini	0.373		

7.16 Indicators of variability remain fairly low, but holding areas are determined to a large extent by whether or not a farmer has tree crops.

# HOLDING SIZE DISTRIBUTION

all holdings - tree crops only

holding size (ha)

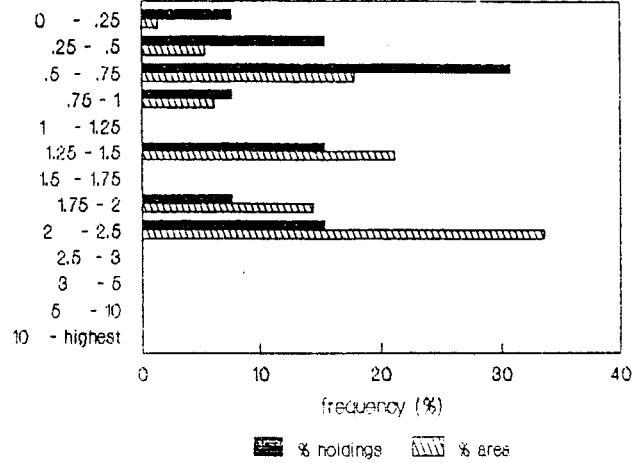


Diagram: 7.9

# LORENZ CURVE

all holdings - tree crops only

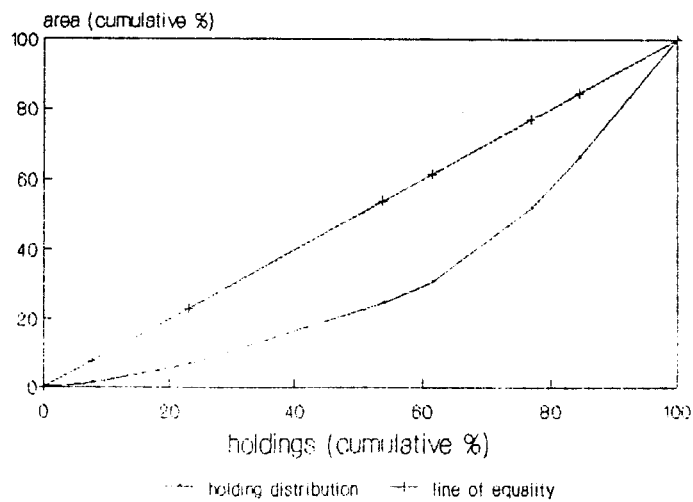


Diagram: 7.10



## Chapter: 8

### LABOUR DENSITY

8.1 According to Bathgate<sup>(18)</sup> "increments in the population of a household do not result in an expansion in the garden area. Instead, the garden area holds constant and ... the actual area per consumption and labour unit decreases ... Although there is a variation ... the average household ... tends to clear a fairly similar amount of land for gardens and plant a similar area of root crops". Bathgate postulates that there is no relationship between household size and food garden area. Larger family sizes are not then associated with larger holdings, and he attributes this to a tendency among subsistence producers to cultivate in excess of household requirements as insurance against crop failure.

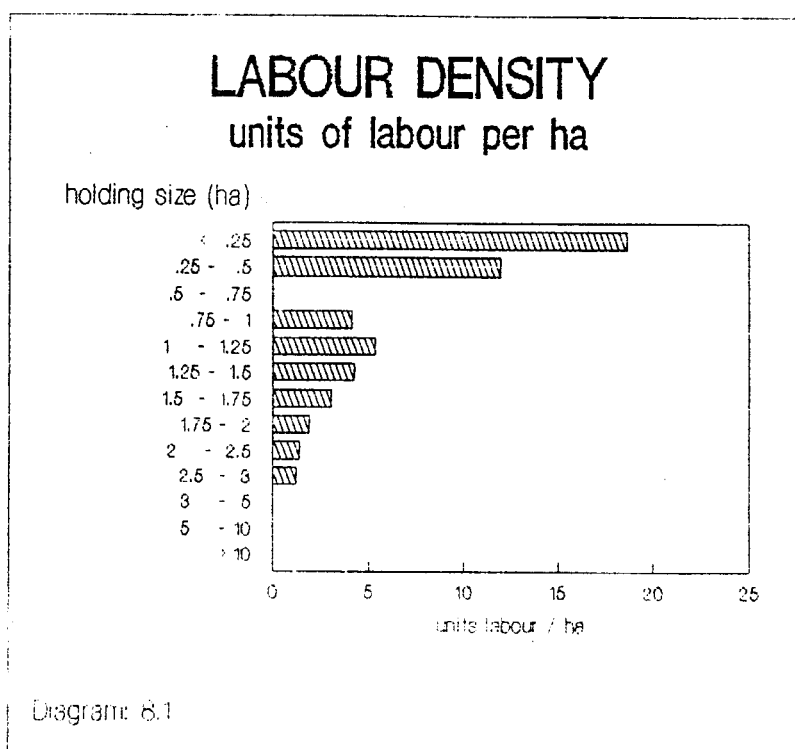
8.2 In the present survey the area of food crops is found to be relatively constant in comparison to a variable tree crop area. Table 8.1 shows the relationship between holding size and labour availability.

Table: 8.1  
LABOUR DENSITY - ALL HOLDINGS  
i) All holdings

holding size class (ha)	:	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	:	3.34	0.54	6.21	40
< .25	:	2.79	0.15	18.63	23
.25 - .5	:	4.21	0.35	11.97	7
.5 - .75	:				
.75 - 1	:	3.47	0.84	4.12	3
1 - 1.25	:	5.60	1.05	5.34	1
1.25 - 1.5	:	5.80	1.36	4.25	1
1.5 - 1.75	:	5.10	1.68	3.04	1
1.75 - 2	:	3.60	1.92	1.88	1
2 - 2.5	:	3.10	2.26	1.37	2
2.5 - 3	:	3.00	2.52	1.19	1
3 - 5	:				
5 - 10	:				
> 10	:				

8.3 There is no apparent relationship between holding size and available labour. Results are in agreement with Bathgate's findings since labour density falls rapidly from 18.63 adult units per hectare for the smallest holding class (less than 0.25ha) to 1.19 units in the largest (2.5-3ha) class. Small holdings then have a very high labour density while the larger holdings have a moderately low labour density, as seen in diagram 8.1.

8.4 Labour densities are high on small holdings, and with a mean of 3.34 labour units per hectare labour is unlikely to be limiting on most holdings.



8.5 Holdings without tree crops are shown in table 8.2.

Table: 8.2

LABOUR DENSITY - NON-TREE CROP HOLDINGS

holding size class (ha)	:	units of labour	mean holding area (ha)	labour density (labour/ha)	number of observations
all holdings	:	3.17	0.17	18.24	27
< .25	:	2.77	0.15	19.07	22
.25 - .5	:	4.90	0.30	16.47	5
.5 - .75	:				
.75 - 1	:				
1 - 1.25	:				
1.25 - 1.5	:				
1.5 - 1.75	:				
1.75 - 2	:				
2 - 2.5	:				
2.5 - 3	:				
3 - 5	:				
5 - 10	:				
> 10	:				

8.6 The range of holding size is much smaller and the mean labour density is 18.24 labour units per hectare. The largest holdings of up to 0.5ha in size have a labour availability of 16.47 units per hectare. All holdings have a high labour density, suggesting under-employment in agriculture.

8.9 With small holdings and high labour densities there is unlikely to be a significant constraint to agricultural development in terms of labour availability.

8.8 There is no apparent relationship between holding size and labour availability. The mean labour density is 2.85 units per hectare, falling off from 13.03 units per hectare on the smaller holdings to 1.19 units per hectare on the holding of 2.5 to 3ha in size.

holding	units	mean	labour	number
size class	of	holding	density	of
(ha)	labour	area	(labour/ha)	observations
all holdings	3.68	1.29	2.85	13
< .25	3.20	0.25	13.03	1
.25 - .5	2.50	0.49	5.11	2
.5 - .75				
.75 - 1	3.47	0.84	4.12	3
1 - 1.25	5.60	1.05	5.34	1
1.25 - 1.5	5.80	1.36	4.25	1
1.5 - 1.75	5.10	1.68	3.04	1
1.75 - 2	3.60	1.92	1.88	1
2 - 2.5	3.10	2.26	1.37	2
2.5 - 3	3.00	2.52	1.19	1
3 - 5				
5 - 10				
> 10				

Table: 8.3  
LABOUR DENSITY - TREE CROP HOLDINGS

8.7 Holdings with tree crops are shown in table 8.3.

## Chapter: 9

### CROPPING PATTERNS

9.1 A "holding" is taken here to be the total area cultivated by a household. It includes all crops growing and land cleared, but does not include fallow which the family may have rights to cultivate.

9.2 A holding is divided into one or more "gardens", which are contiguous blocks of land growing similar crops. Only broad distinctions are made among crop types in gardens.

9.3 A garden may be subdivided into "plots" which are blocks within each garden growing a different crop mix, under different management, or planted at different times. Within plots detailed crop mixtures are recorded.

9.4 Table 9.1 describes cropping patterns at the garden level, maintaining the distinction between farmers with tree crop gardens and those without. A tree crop garden is taken to be a garden in which one or more plots have coconut or cocoa as the dominant crop.

9.5 Tree crop farmers have a mean holding size of 1.29ha, of which 1.01ha is tree crops and 0.28ha food crops. In contrast, non-tree crop farmers have a mean holding size of 0.17ha.

9.6 Tree cropping farmers tend to have more complex holdings, with an average of 4.16 gardens and 4.54 plots compared with 2.22 gardens and 2.55 plots among non-tree crop farmers.

9.7 Table 9.2 describes cropping patterns in more detail. This is derived from the aggregation of plot information in which complex mixtures are summarised by the dominant crop.

9.8 8 major crop mixture classes are listed in table 9.2, predominantly coconuts and cocoa and root crops.

Table: 9.1  
CROP COMPOSITION

i) All holdings

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops	0.33	0.35	0.35	1.00	+++
short term cash crops		0.03	0.03	1.00	
food crops	0.21	2.48	2.83	1.14	++
total	0.54	2.86	3.21	1.12	

number of observations = 40

ii) Holdings with tree crops

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops	1.01	1.08	1.08	1.00	+++++++
short term cash crops					
food crops	0.28	3.08	3.46	1.12	++
total	1.29	4.16	4.54	1.09	

number of observations = 13

iii) Holdings without tree crops

crop category	mean area in holding (ha)	mean no gardens per holding	mean no plots per holding	mean no plots per garden	summary of crop area
cleared land					
tree crops					
short term cash crops		0.03	0.03	1.00	
food crops	0.17	2.19	2.52	1.15	+
total	0.17	2.22	2.55	1.15	

number of observations = 27

Table: 9.2  
CROPPING PATTERNS

main crop in mixture	all farmers		<----- farmers with ----->			
			no tree crops		tree crops	
	<-- area -->		<-- area -->		<-- area -->	
	(ha)	%	(ha)	%	(ha)	%
a Cleared Land						
b Coconut	0.330	61			1.015	79
c Cocoa						
z Coconut and Cocoa						
d Pasture						
e Grain Crops						
f Beans						
g Cabbage	0.001	0			0.002	0
h Vegetables						
i Spices						
j Fruit Crops	0.001	0	0.001	1		
k Fruit trees						
l Banana						
m Citrus trees						
n Nut trees						
o Sugar cane						
p Food/building tree						
q Tobacco						
r Sweet Potato	0.070	13	0.066	38	0.079	6
s Taro	0.005	1	0.002	1	0.009	1
t Yam	0.112	21	0.090	52	0.159	12
u Pana	0.018	3	0.014	8	0.025	2
v Cassava	0.001	0			0.002	0
w Other root crop						
I						I
I Total mean area (ha)	0.537		0.174		1.292	I
I						I
I Number of households	40		27		13	I
I						I

9.9 Despite the small proportion of farmers, the spatial dominance of coconuts is seen clearly in diagrams 9.1 to 9.3 where coconuts account for 61% of the cropped area

9.10 Table 9.2 is still a simplification of cropping patterns found in the field. Table 9.3 describes in more detail the crop mixtures grown by farmers. This no longer applies to a "model" holding but, in aggregate, detailed cropping patterns may be used to determine proportional areas under crop mixtures. Mixtures are listed hierarchically to the left of the table according to the relative dominance of each crop in the mixture. The three main crops are listed by name and any further crops are referred to by code letters. The column of "mean plot area" records the mean area of plots measured in the field according to the number of observations shown in the next column to the right. The column on the far right is the proportional area by crop mixture.

9.11 Crop mixtures illustrate the complexity of smallholder farming systems, in which 89 distinct mixtures are recorded. Small areas of vegetable and short term cash crops are typically scattered among food gardens but tree crops are of very minor importance.

9.12 Table 9.4 summarises tree cropping. The table is in two parts, first showing the average number of trees and second the number of observations on which they are based. Each table is subdivided horizontally into cultivated garden and fallow, and vertically by garden type.

9.13 The averages in the top table are based on all plots (not only the plots in which trees are grown). In the far right column of the lower table is listed the number of observations for which trees are too numerous to count. These are excluded from the averages in the upper table.



## CROPPING PATTERNS all farmers

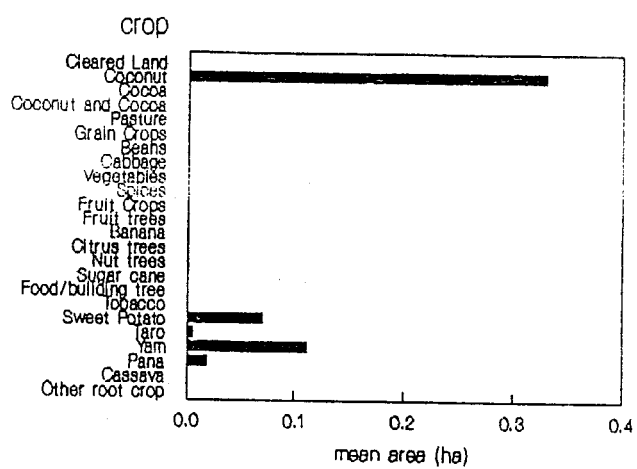


Diagram: 9.1

## CROPPING PATTERNS

farmers with no tree crops

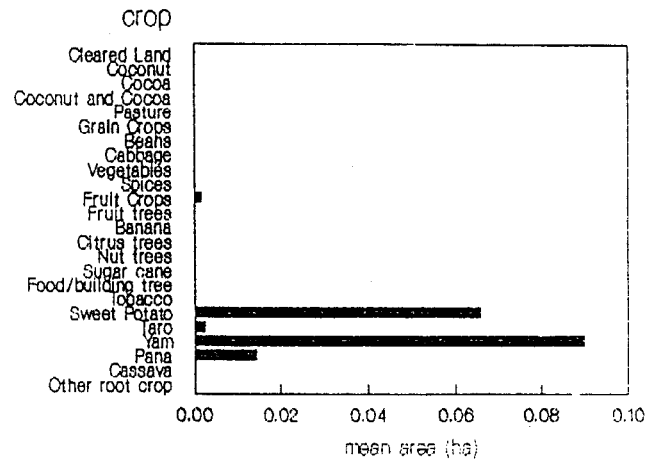


Diagram: 9.2

## CROPPING PATTERNS

farmers with tree crops

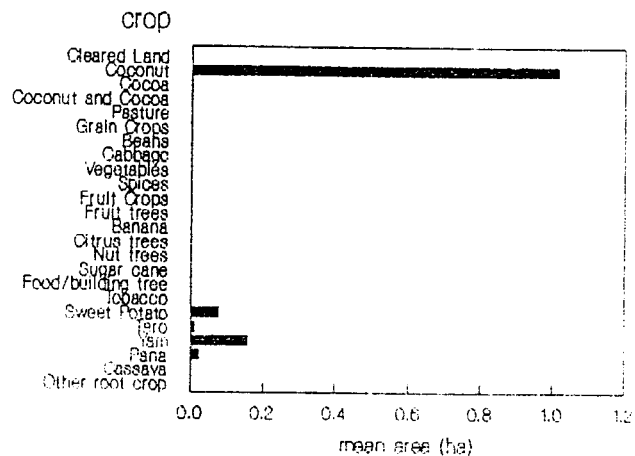


Diagram: 9.3

Table: 9.3  
DETAILED CROPPING PATTERNS

(<----- main crop in mixture ----->)				minor	mean	number	%	%
crop	<----- crop name ----->			mixture	plot	of	plots	area
code	first	second	third	code	area	plots		
					(ha)			
TOTAL					0.0601	128	100	100
b	Coconut				0.9819	13	10	59.68
		Other root	Food/bld tree	1	0.3307	1	1	1.546
g	Cabbage	Banana	Sweet potato		0.0209	1	1	0.097
j	Fruit crops	Other root	Pana	g	0.0397	1	1	0.185
r	Sweet Potato				0.0658	8	6	2.462
		Cabbage			0.0228	2	2	0.212
			Fruit crops		0.0610	1	1	0.285
			Fruit trees		0.0896	1	1	0.418
			Banana		0.0527	2	2	0.492
			Taro		0.0610	1	1	0.285
		Fruit crops			0.0881	3	2	1.235
			Cabbage		0.0664	1	1	0.310
				w	0.0712	1	1	0.332
			Sugar cane	g	0.1223	1	1	0.571
		Fruit crops	Taro		0.0399	1	1	0.186
		Fruit trees			0.0427	1	1	0.199
			Cabbage		0.0995	2	2	0.930
			Taro	t	0.0678	1	1	0.317
		Banana			0.0213	1	1	0.099
			Taro	g	0.0636	1	1	0.297
		Sugar cane			0.0469	1	1	0.219
			Cabbage		0.0610	1	1	0.285
		Taro			0.0653	1	1	0.305
			Fruit crops		0.0212	1	1	0.099
			Sugar cane		0.0614	1	1	0.287
			Pana	vk	0.1020	1	1	0.476
			Cassava	e	0.0562	1	1	0.262
				l	0.0289	1	1	0.135
				lt	0.0964	1	1	0.450
		Pana	Fruit crops	e	0.0459	1	1	0.214
			Taro	ok	0.0815	1	1	0.381
			Cassava	jl	0.0364	1	1	0.170
		Cassava			0.0410	2	2	0.383
			Fruit trees		0.0797	1	1	0.372
			Taro	o	0.0955	1	1	0.446

## CROPPING PATTERNS (continued)

<----- main crop in mixture ----->				minor mixture code	mean plot area (ha)	number of plots	% plots	% area
crop code	<----- crop name ----->							
	first	second	third					
s	Taro				0.0524	1	1	0.245
		Cabbage	Banana	o	0.0294	1	1	0.137
			Cassava		0.0236	1	1	0.110
		Yam			0.0289	2	2	0.270
		Other root			0.0221	1	1	0.103
t	Yam				0.1149	2	2	1.074
		Cabbage			0.0147	2	2	0.137
			Taro		0.0562	1	1	0.262
		Banana	Cabbage	b	0.0793	1	1	0.370
		Sweet potato	Taro	vkq	0.0345	1	1	0.161
		Taro			0.0560	3	2	0.785
			Cabbage	ur	0.0644	1	1	0.301
			Fruit trees		0.0664	1	1	0.310
				l	0.0733	1	1	0.342
			Sugar cane	j	0.0554	1	1	0.259
			Tobacco	lg	0.0651	1	1	0.304
			Pana	g	0.0672	1	1	0.314
				o	0.1438	1	1	0.672
			Cassava	lg	0.0954	1	1	0.446
			Other root		0.0947	2	2	0.885
		Pana			0.0243	2	2	0.226
			Cabbage		0.1012	1	1	0.473
			Fruit crops		0.1336	1	1	0.624
			Sugar cane	w	0.0669	1	1	0.312
			Sweet potato	v	0.1371	1	1	0.641
			Taro		0.1422	4	3	2.658
				gk	0.1375	1	1	0.642
				glk	0.2059	1	1	0.962
				jol	0.0998	1	1	0.466
				lg	0.1230	1	1	0.575
				lgv	0.0682	1	1	0.318
				o	0.0310	1	1	0.144
				r	0.0513	2	2	0.479
				re	0.1269	1	1	0.593
				rge	0.0627	1	1	0.293

# CROPPING PATTERNS (continued)

<----- main crop in mixture ----->				minor mixture code	mean plot area (ha)	number of plots	% plots	% area
crop code	<----- crop name ----->							
	first	second	third					
t	t	u	s	v	0.0720	1	1	0.336
				wjlg	0.2364	1	1	1.105
			Cassava	rg	0.1330	1	1	0.621
				sj	0.0582	1	1	0.272
			Other root		0.0889	2	2	0.830
				g	0.0361	1	1	0.168
				k	0.0588	2	2	0.549
				lg	0.1070	1	1	0.500
				u	0.1253	1	1	0.585
u	Pana				0.0409	2	2	0.382
		Tobacco	Taro		0.0568	1	1	0.265
		Sweet potato	Taro	gt	0.0607	1	1	0.283
		Taro	Cassava		0.0619	1	1	0.289
				lk	0.1072	1	1	0.501
			Other root	jglb	0.1368	1	1	0.639
		Yam			0.0896	1	1	0.418
			Taro	o	0.0538	1	1	0.251
			Cassava	gs	0.0643	1	1	0.300
v	Cassava				0.0308	1	1	0.144

## Crop Key:

a Cleared land	j Fruit crops	r Sweet potato
b Coconut	k Fruit trees	s Taro
c Cocoa	l Banana	t Yam
d Pasture	m Citrus trees	u Pana
e Grain crops	n Nut trees	v Cassava
f Beans	o Sugar cane	w Other root crop
g Cabbage	p Food/building tree	
h Vegetable	q Tobacco	
i Spices		

Note: "Other root crop" (code w) is the yam *Dioscorea bulbifera*

Table: 9.4  
TREE CROPS IN GARDENS

<----- average number of trees per garden ----->

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) In cultivated gardens:					
fruit trees				0.27	0.23
citrus				0.01	0.01
nut trees				0.08	0.07
sweet banana				0.14	0.12
cooking banana				0.47	0.42
ii) In fallow of gardens:					
fruit trees				0.49	0.43
citrus					
nut trees				0.12	0.11
sweet banana				0.18	0.16
cooking banana				0.53	0.46

<----- number of observations ----->

crop type:	cleared land	tree crops	short term cash crops	food crops	many but "unknown"
i) In cultivated gardens:					
fruit trees		14		97	2
citrus		14		99	
nut trees		12		98	3
sweet banana		14		99	
cooking banana		14		99	
ii) In fallow of gardens:					
fruit trees		14		99	
citrus		14		99	
nut trees		13		97	3
sweet banana		14		99	
cooking banana		14		99	

9.14 Tree crops are not as important as in many other areas. Bananas, particularly for cooking, are the most important tree crops. Fruit trees and nut trees are of lesser importance.

## Chapter: 10

### COCONUT AND COCOA

10.1 Coconut and cocoa have been studied in some detail before, both in the 1974-75 Sample Survey of Agriculture<sup>(5)</sup> and in the 1985 Coconut Survey<sup>(6)</sup>. Only comparative data are therefore included in the present survey.

10.2 Copra exports from Solomon Islands started in the late 19th century, rising from 1,220 MT in 1895 to 23,000 MT in the '20s and '30s. Following disruption during the second world war production did not achieve pre-war levels again until the 1960s. Copra production has continued to rise since, exceeding 40,000 MT in 1984 and 1985. Following cyclone Namu copra production fell by about 20 to 25%, but showed some recovery in 1987/88.

10.3 The structure of the copra economy has varied considerably since the start of trading. Initially a smallholder crop, the plantation sector came to dominate production from 1915 onwards. Since the 1970s smallholder production has been growing by about 4.5% annually and smallholder copra production now accounts for around 70% of the total<sup>(8)</sup>.

10.4 The area under smallholder coconuts has expanded considerably over the past 15 years, in part due to a subsidy scheme operating from 1968 to 1978 which was designed to encourage the rehabilitation, planting and replanting of coconut palms. Consequently the age structure of smallholder palms is young, with almost half the palms planted since 1970 and nearly 90% planted since the war<sup>(8)</sup>.

10.5 The total number of coconut palms in Solomon Islands is estimated to be around 9 million, covering an area of approximately 60,000 hectares. Table 10.1 shows the provincial breakdown of copra production, in which Western, Guadalcanal, Malaita and Central Provinces account for about 80% of production.

10.6 The mean national copra yield is 0.72 MT per hectare according to the 1985 Coconut Survey<sup>(7)</sup>. The 1974-75 Sample Survey of Agriculture found that the average number of coconuts per palm was 36 (30 in the 1985 Coconut Survey) and assumes an average whole nut weight of 1.2kgs with 190gm dried copra equivalent per nut. Disciplined plantings were found to yield 40% more per tree than customary plantings, but only 7% more per unit area because of the greater density of customary planted trees. This result was questioned in the 1985 Survey.

Table: 10.1

COPRA AREA AND PRODUCTION BY PROVINCE (1984)

Province	<-- area -->		<-- production -->		yield	number of palms
	(ha)	%	(MT)	%	(MT/ha)	
Western	14,454	25	13,816	32	0.96	2,093,795
Ysabel	5,230	9	2,969	7	0.57	817,555
Central	7,909	13	9,073	21	1.15	1,287,680
Guadalcanal	12,758	22	7,324	17	0.57	1,824,790
Malaita	11,890	20	5,575	13	0.47	1,980,595
Makira	3,555	6	2,662	6	0.75	540,810
Temotu	3,032	5	1,167	3	0.38	494,420
Total	58,828	100	42,536	100	0.72	9,039,645

Source: Statistics Office, Solomon Islands (1986), Statistical Bulletin 18/86

10.7 The yield from well maintained plantations was found to be higher than from poorly maintained plantations, but the 1985 Coconut Survey attributed this to more intensive harvesting<sup>(5)</sup> rather than the productivity of palms.

10.8 In the 1985 Coconut Survey soil type was classified into three broad categories. 41% of plots lay on sand or coral; 47% on black alluvial soils; and 21% on red clay. It was concluded that the reason for low yields is often area specific but soil nutrient deficiency, notably potassium, is an important factor. Despite this, and high copra prices at the time, the 1974-75 survey found that "fertilizer is only applied when provided under some sort of subsidy scheme" and that "smallholder farmers will not buy fertilizer to use on their own plots. There is generally a lack of understanding of the use of fertilizer by farmers, and in many cases a reluctance to use it even when it is provided at a subsidised price"<sup>(5)</sup>.



10.9 Other important factors identified in the 1985 Coconut Survey as affecting production were pests and disease. Over half the plots sampled in the 1985 suffered from Leaf Spot, which may refer to the symptoms of pest infestation or nutrient deficiency. One quarter of plots showed some evidence of White Thread, but it was felt that neither problem significantly affected output. About 40 to 50 percent of plots were felt to be disease free<sup>(7)</sup>.

10.10 Amblypelta cocophaga appeared to be a significant pest in parts of Western province, the Floridas, Guadalcanal and Malaita. 38% of households reported premature nutfall which is linked to Amblypelta in certain localities. Brontispa spp was also evident, and minor pests included rhinoceros beetle<sup>(7)</sup>, (Scapanes australis), rats, cockatoos, flying foxes and others.

10.11 The coconut survey of 1985 found that the average spacing of 7.5 metres for palms was not significantly different between triangular and square planted plots. On customary plantings there was a wide variation in planting density, but the majority of plots were similar to disciplined plantings<sup>(7)</sup>.

10.12 The 1974-75 sample survey of agriculture found that more than half of all immature palms were well maintained. Among bearing trees more than 60% of disciplined plantings were well maintained compared to 47% of customary planted palms<sup>(5)</sup>. The 1985 coconut survey found lower management standards, and that even with 30% of farmers hiring workers to assist with maintenance only 39% of plots were well brushed. 47% revealed weed growth to shoulder height, and 13% of plots were totally neglected<sup>(7)</sup>. The relationship between levels of maintenance, yield and soil conditions was not established in the 1985 survey.

10.13 Table 10.2 presents additional results from the present study. Coconut plots are pure stand except for young plantings in food gardens. There is no occurrence of cocoa among sampled farmers.

10.14 Maintenance standards in the survey area are moderate, with 7% of plots undercropped and 21% brushed to ground level. 29% are brushed to shoulder height and 43% have a ground cover of secondary bush. Maintenance levels are illustrated in diagram 10.1.

Table: 10.2  
COCONUTS AND COCOA

	<----- % plots ----->		
	coconut	cocoa	coconut + cocoa
i) Intercropping:			
Pure stand	93		
Intercropping with:			
Coconut + cocoa			
Short term cash crops			
Food crops	7		
Livestock			
-----			
Total %	100		
Number of observations (plots)	14		
-----			
ii) Maintenance:			
Undercropped	7		
Brushed to ground level	21		
Brushed to shoulder height	29		
Secondary bush	43		
Burnt			
-----			
Total %	100		
Number of plots	14		
-----			
iii) Coconut variety composition			
Tall	100		
Rennel			
Dwarf			
Other			
-----			
Total %	100		
Number of plots	14		
-----			
iv) Coconut age composition			
< 8 years	21		
9 - 16 years	19		
17 - 40 years	31		
> 40 years	30		
senescent			
-----			
Total %	100		
Number of plots			
-----			

v) Cocoa age composition

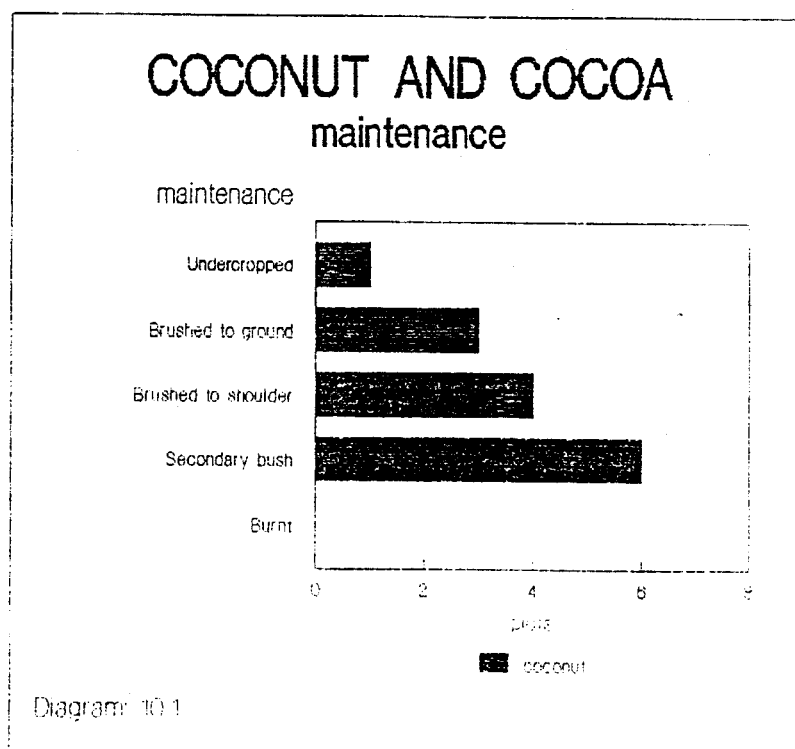
< 3 years  
 3 - 5 years  
 6 - 25 years  
 > 25 years

-----  
 Total %  
 Number of plots  
 -----

vi) Cocoa shade

coconuts  
 planted shade  
 natural shade  
 planted and natural

-----  
 Total %  
 Number of plots  
 -----



10.15 In the survey the coconut variety is entirely local tall. 21% are eight years or less in age, 19% all 9-16 years, 31% are 17-40 years and 30% are stands of older than 40 years.

## Chapter: 11

### FALLOW

11.1 Throughout Solomon Islands almost all gardens are cultivated according to a form of shifting cultivation with bush fallow. In the 1974-75 Sample Survey of Agriculture it was found that, where population density or land tenure problems have restricted the availability of suitable land, the length of fallow may be reduced from the optimum 7 to 20 years to as little as one or two years. In such areas soil fertility is diminished through over frequent cropping<sup>(5)</sup>.

11.2 Solomon Islands soils generally have a low to very low potassium status. The geology of the country is composed in the main of rocks which are low in potassium bearing minerals, and potassium is readily leached under conditions of continuously high rainfall and rugged topography. Fallow is essential for the restoration of potassium fertility: "Under traditional shifting cultivation the depletion of potassium by crops is gradually reversed over a period of 3-15 years or more by a combination of mineral weathering and root systems incorporating potash in the nutrient cycle". Although burning leads to an erratic distribution of potassium in the topsoil, "the burning of vegetative trash is beneficial and it has been shown that topsoil potassium is increased by as much as 100% on average after burning, all of this increase being held by the exchange complex"<sup>(9)</sup>.

11.3 Research on Malaita has shown that the average tuber yield of sweet potato is 9.3t/ha on sites of more than 10 years of fallow, falling off rapidly to 6.0t/ha on land of 5 - 9 years of fallow; 4.8t/ha on land of 0 - 4 years of fallow; and 3.5t/ha on successively cropped land. A residual yield of 2 - 6t/ha "seems to represent the rate of release of potassium from slowly available reserves in soil and weathering parent material within rooting depth". Large amounts of fertiliser are required to restore yields. A supply of 112kg/ha K is only marginally beneficial and inadequate to replenish the rate of potassium removal by the crop. 200 to 300kg/ha K is said to be required to restore<sup>(9)</sup> yields to levels commensurate with long fallow periods.

11.4 Phosphorus varies widely in its total and available forms, but Solomon Islands soils generally have low levels in the subsoil and medium levels of total phosphorus in the topsoil. Most soils used for agriculture have satisfactory levels of phosphorus but as land pressure increases deficiencies may become more widespread. Humus in the topsoil is accompanied by an increase in phosphorus, mainly in organic form, which may become readily available<sup>(9)</sup>.

11.5 Soil total nitrogen levels are generally adequate, with C:N ratios in the range 7-13 signifying the ready availability of nitrogen. Topsoil nitrogen is dependent on land use and in particular the length of fallow since there is a build-up of topsoil nitrogen under secondary regrowth. Sulphur is similarly associated with organic matter, and is higher under forest than under burned grassland<sup>(9)</sup>.

11.6 There is a close relationship between pH and organic matter. The lower the pH the greater the surface organic matter and the higher the subsoil organic carbon content. Difficulties associated with low pH such as aluminium toxicity are only likely to be widespread in the New Georgia group and possibly Ysabel. Alkaline soils are fairly widespread and are associated with reef limestone. The chief problem induced by alkaline calcareous soils is lime induced chlorosis of foliage which results from deficiencies of iron, manganese, zinc and copper<sup>(9)</sup>.

11.7 In addition there is a close relationship between soil depth and soil fertility. "All stable sites tend to favour an accumulation of maximum weathered material due to minimal losses by surface erosion. Thus there arises the paradox that on stable hill sites and terraces the soils tend to be deepest but least fertile, while on adjacent steep slopes the soils are relatively unweathered, and hence fertile, but shallow"<sup>(9)</sup>.

11.8 The shifting system of smallholder agriculture in Solomon Islands is suited to the environment and prevailing management where land pressure is low. Soil fertility is restored during fallow periods, and small isolated areas of mixed cropping are not conducive to pest build-up. Burning of surface vegetative trash not only releases a flush of nutrients, of which the most important is potassium, but is also a useful phytosanitary measure which destroys weed seeds, some insects and undesirable pathogens<sup>(9)</sup>.

11.9 An analysis of fallow therefore tells much about the dynamics of smallholder agriculture, and likely pressures on farming systems. Hansell and Wall<sup>(10)</sup> state that "there is little doubt that the major factor influencing the decision to abandon the garden is the decline in crop productivity but the exact causes of the decline are not fully understood". The greatest decline in production is between the first and second crops, rather than between the second and subsequent crops. They estimate that despite reduced yields there is still a good return from a low input of labour and conclude that reduced yields alone is insufficient reason for the abandonment of a garden. An important consideration may be the build-up of soil-borne plant diseases causing the rotting of corms or tubers, insect attack and weed infestation<sup>(10)</sup>.

11.10 In the 1974-75 Sample Survey of Agriculture<sup>(5)</sup> it was stated that, while in overall terms Solomon Islands cannot be said to be suffering from land pressure, it may occur in some areas. Table 11.1 shows the distribution of garden land by the length of the bush fallow in 1975.

Table: 11.1  
LENGTH OF BUSH FALLOW (1975)

length of bush fallow (years)	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
	% observations				
< 2	23	6	17	16	14
2 - 4	20	5	33	14	18
5 - 7	4	11	25	12	15
8 - 10	10	10	8	15	10
> 10	13	20	3	14	13
never previously cultivated	29	48	15	29	32
Mean length fallow (years)	5.6	9.2	4.5	6.7	6.4

Source: Statistics Office (1978), 1974-75 Agricultural Statistics Survey

11.11 Table 11.2, also from the 1974-75 survey, shows the distribution of garden land by length of cultivation.

Table: 11.2  
LENGTH OF CULTIVATION (1975)

length of cultivation (months)	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
	% observations				
< 4	20	45	11	19	27
4 - 6	62	31	36	22	37
7 - 9	12	13	25	33	19
10 - 12	5	8	14	18	10
> 12	2	4	14	8	7
Mean cultivation (months)	5.1	4.7	7.6	7.2	6.0

Source: Statistics Office (1978), 1974-75 Agricultural Statistics Survey

11.12 In 1975 it was found that 32% of gardens in Solomon islands had never been previously cultivated, and that the average length of bush fallow of cultivated gardens was 6.4 years. Only 7% of gardens were generally cultivated for more than 12 months before reverting to fallow, and the average length of cultivation of food gardens was 6 months.

11.13 Table 11.3 summarises cropping intensity in the survey area. The crop period is shown in the first column, which is the time from planting to harvest for the named crop.

Table: 11.3  
CROPPING INTENSITY

crop type		harvest to harvest (months)	number of crops in sequence	number of cases (obs)
all crops		6.1	5.4	128
coconut	b	5.6	2.9	14
cabbage	g	4.0	5.0	1
fruit crops	j	6.0	6.0	1
sweet potato	r	4.5	5.5	44
taro	s	6.8	4.3	6
yam	t	7.1	6.0	51
pana	u	7.4	5.7	10
cassava	v	8.0	3.0	1

11.14 The second column describes the number of times an area is cropped in sequence before reverting to fallow. This introduces complexity since the crop type may, and commonly does, change within the sequence. The table therefore shows different stages in the cropping sequence. The dominant root crops are yam and pana with 61 observations and sweet potato with 44 observations. Taro and cassava are of importance.



11.15 Table 11.4 describes the fallow period, however, this has little meaning for tree crops since the interpretation of fallow varies with the age of the tree crop and previous cropping history. For food crops the fallow period relies on the knowledge of the respondent. Often it is found that long fallow periods are beyond the memory of operators and these are referred to as "cases longer than memory". 44% of gardens have such long fallows. Where the fallow period is known on food gardens there are 7.8 years of fallow between cropping.

Table: 11.4  
FALLOW PERIOD (years)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
mean years of fallow		3.8		7.8	7.6
standard deviation (years)		2.5		4.4	4.4
number of cases (gardens)		4		59	63
cases longer than memory					50
total cases (gardens)					113

11.16 Fallow periods cover a range of soil and site conditions, and are themselves variable. Table 11.5 shows that 40% of fallow periods on food gardens are longer than memory, representing 44% of the food garden area.

Table: 11.5  
FALLOW RANGE

i) Fallow Range by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no fallow		1			1
1 year					
2 years				1	1
3 years				1	1
4 years				4	4
5 years		3		12	15
6 - 10 years				33	33
11 - 20 years				7	7
21 - 50 years				1	1
beyond memory ("long time")		10		40	50
total by crop type		14		99	113

ii) Fallow Range by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no fallow					
1 year					
2 years					
3 years					
4 years					
5 years		23		5	27
6 - 10 years				14	14
11 - 20 years				5	5
21 - 50 years					
beyond memory ("long time")		36		18	55
total by crop type		59		41	100

Note: The table of % area is only approximate due to rounding small numbers

11.17 The type of fallow in the survey area is shown in table 11.6.

Table: 11.6  
FALLOW TYPE

i) Fallow type by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
primary forest		3		17	20
secondary forest		8		75	83
dense thicket		1		7	8
open scrub grassland					
grassland					
plantation trees/planted					
other fallow		2			2
total by crop type		11		99	110

Note: "Other" fallow is in one case the planting on a former village site, and in the other case is continuous cropping without fallow.

ii) Fallow type by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
primary forest		9		9	17
secondary forest		35		26	61
dense thicket		4		4	9
open scrub grassland					
grassland					
plantation trees/planted					
other fallow		13			13
total by crop type		61		39	100

Note: The table of % area is only approximate due to rounding small numbers

11.18 91% of all gardens have a fallow of primary or secondary forest extending over 78% of the cultivated area.

11.19 23% of the food garden area is cut from primary forest compared with 15% of the tree area. Since tree areas are semi-permanent while annual cropping is constantly shifting, the encroachment of food gardens on the primary forest may be relatively rapid with respect to the area under annual crops.

11.20 Table 11.7 summarises the application of agricultural inputs for the control of pests and maintenance of soil fertility. In the survey area no inputs are applied.

Table: 11.7

MANAGEMENT AND APPLICATION OF AGRICULTURAL INPUTS

i) Inputs by frequency of use (gardens)

crop type		row planting	fert- iliser	pest- icide	compost	ash	other	frequency of plots
all plots		6						128
coconut	b	6						14
cabbage	g							1
fruit crops	j							1
sweet potato	r							44
taro	s							6
yam	t							51
pana	u							10
cassava	v							1

ii) Inputs by % area applied

crop type		row planting	fert- iliser	pest- icide	compost	ash	other
all plots		24					
coconut	b	24					
cabbage	g						
fruit crops	j						
sweet potato	r						
taro	s						
yam	t						
pana	u						
cassava	v						

Note: The table of % area is only approximate due to rounding small numbers

## Chapter: 12

### LANDFORM

12.1 The survey area is on the southern coast of Malaita between Tawairoi and Weihi, on the broad coastal plains and river valleys.

12.2 Landforms are broadly subdivided into "lowland" and "upland" where "upland" simply means above the coastal plain or coastal terrace, but does not imply high elevation. Table 12.1 shows the distribution of cultivated land in the survey by landform. The first part of the table records the number of observations (gardens) which is expressed in area terms in the second part of the table.

12.3 79% of tree gardens representing 86% of the tree garden area are on lowland sites, with the remainder on sloping upland sites. 41% of food crop gardens representing 38% of the food garden area are on lowland sites and 59% of food gardens representing 62% of food garden area are on upland, mainly steeply sloping sites.

Table: 12.1

## LANDFORM

i) Landform by number of observations (gardens)

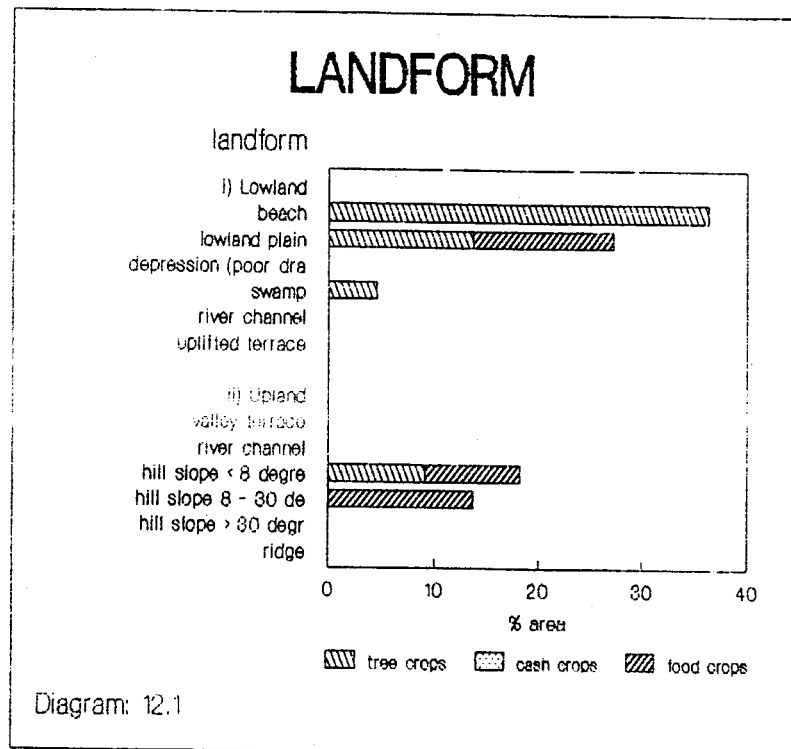
crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Lowland					
beach		7			7
lowland plain		3		41	44
depression (poor drainage)					
swamp		1			1
river channel					
uplifted terrace					
ii) Upland					
valley terrace					
river channel					
hill slope < 8 degrees		2		26	28
hill slope 8 - 30 degrees				28	28
hill slope > 30 degrees		1		4	5
ridge					
total by crop type		14		99	113

ii) Landform by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Lowland					
beach		36			36
lowland plain		14		14	27
depression (poor drainage)					
swamp		5			5
river channel					
uplifted terrace					
ii) Upland					
valley terrace					
river channel					
hill slope < 8 degrees		9		9	18
hill slope 8 - 30 degrees				14	14
hill slope > 30 degrees					
ridge					
total by crop type		64		36	100

Note: The table of % area is only approximate due to rounding small numbers

12.4 A summary of landform and cropping is illustrated in diagram 12.1.



12.5 Table 12.2 describes the characteristics of slope in farming systems. The first part of the table records the frequency of observations (plots) which is expressed in area terms in the second part of the table.

12.6 The mean slope is 8 degrees. 72 plots or 56% of all plots, representing 80% of the total cultivated area, are on sites of less than 5 degrees slope. 15% of the cultivated area is on slopes of 5 to 10 degrees while 5% is on slopes of 20 to 30 degrees.

Table: 12.2  
SLOPE

i) Slope by number of observations (gardens)

crop type		mean slope (degrees)	frequency of plots at different degrees of slope						frequency of plots
			0 - 5 degrees	5 - 10 degrees	10 - 20 degrees	20 - 30 degrees	30 - 50 degrees	> 50 degrees	
all plots		8	72	31	6	15	4		128
coconut	b	4	12	1			1		14
cabbage	g	3	1						1
fruit crops	j	8		1					1
sweet potato	r	8	26	12	1	3	2		44
taro	s	2	5	1					6
yam	t	10	25	13	3	9	1		51
pana	u	16	2	3	2	3			10
cassava	v		1						1

ii) Slope by % cropped area

crop type		frequency of plots at different degrees of slope						total
		0 - 5 degrees	5 - 10 degrees	10 - 20 degrees	20 - 30 degrees	30 - 50 degrees	> 50 degrees	
all plots		80	15		5			100
coconut	b	60	5					65
cabbage	g							
fruit crops	j							
sweet potato	r	10	5					15
taro	s							
yam	t	10	5		5			20
pana	u							
cassava	v							

Note: The table of % area is only approximate due to rounding small numbers



12.7 Table 12.3 summarises conservation measures. No conservation practices or alley cropping were encountered in the survey.

Table: 12.3  
CONSERVATION AND ALLEY CROPPING

i) Conservation by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Conservation none contour cultivation bunding terracing		14		99	113
ii) Alley cropping not performed performed		14		99	113
total by crop type		14		99	113

ii) Conservation by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
i) Conservation none contour cultivation bunding terracing		62		38	100
ii) Alley cropping not performed performed		62		38	100
total by crop type		62		38	100

Note: The table of % area is only approximate due to rounding small numbers

12.8 The spatial distribution of gardens is shown in diagrams 12.2 to 12.4, which illustrate the relationships between crop type, crop area, and the distance of gardens from households.

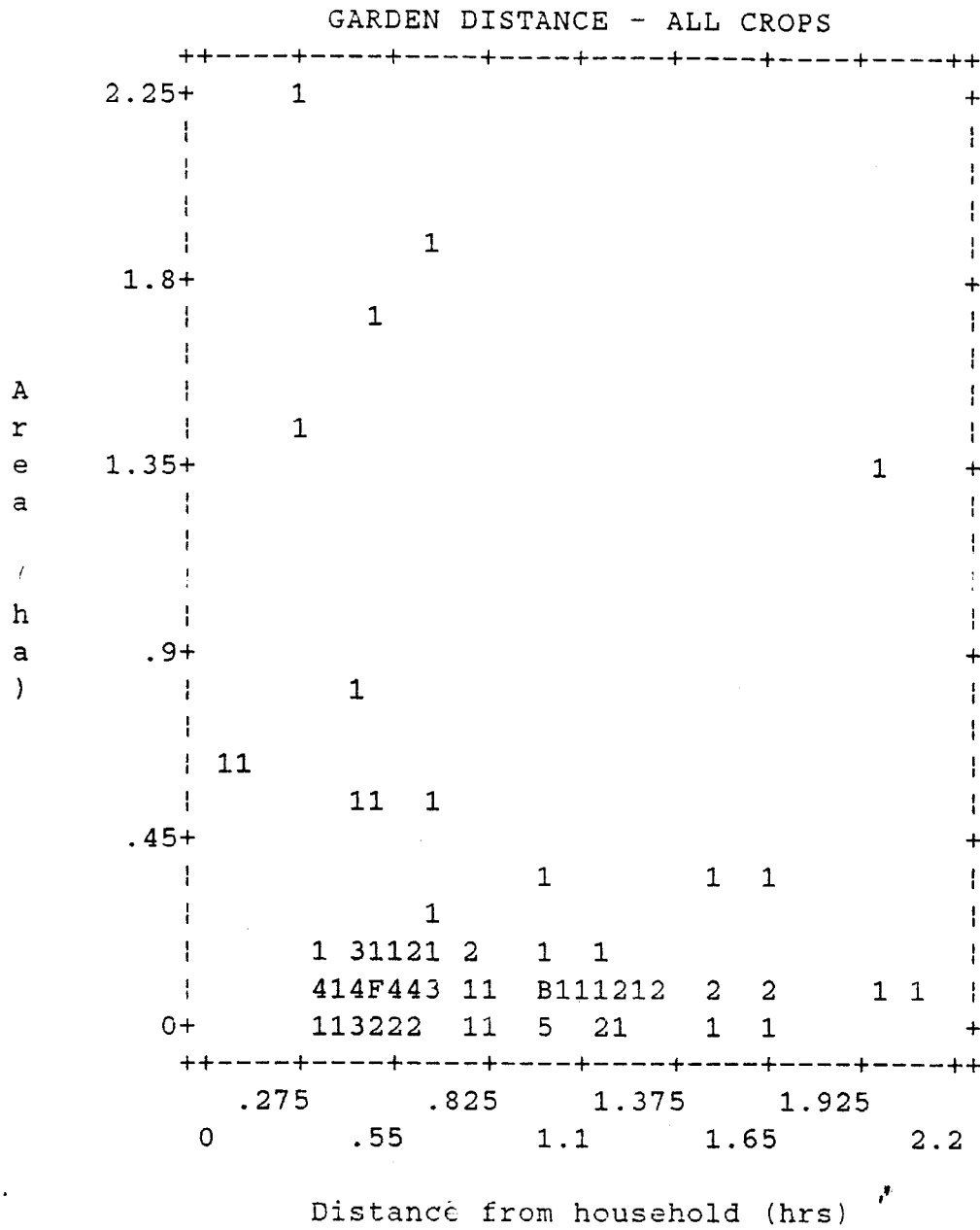
2.9 Diagram 12.2 is the graph of gardens for all crops, while subsequent diagrams show the distance relationships for the major crop types. The graph shows the relationship between garden area (vertical axis) and the time taken to reach the garden from the household (horizontal axis). Graph entries represent the number of observations (gardens) and are numbered from 1 to 9 and thereafter alphabetically. Thus where points coincide the number of points is shown: 9 occurrences is recorded as "9"; 10 occurrences as "A"; 13 occurrences as "D"; and so on.

12.10 The mean time taken to reach gardens is .601 hours, or about 36 minutes, with a maximum time of 2.05 hours. There is no apparent relationship between garden size and distance from the household.

12.11 Diagram 12.3 shows the relationship between distance and area of tree crop gardens. The mean time taken to reach tree crop gardens from the household is .506 hours, with a maximum recorded time of 2.00hrs.

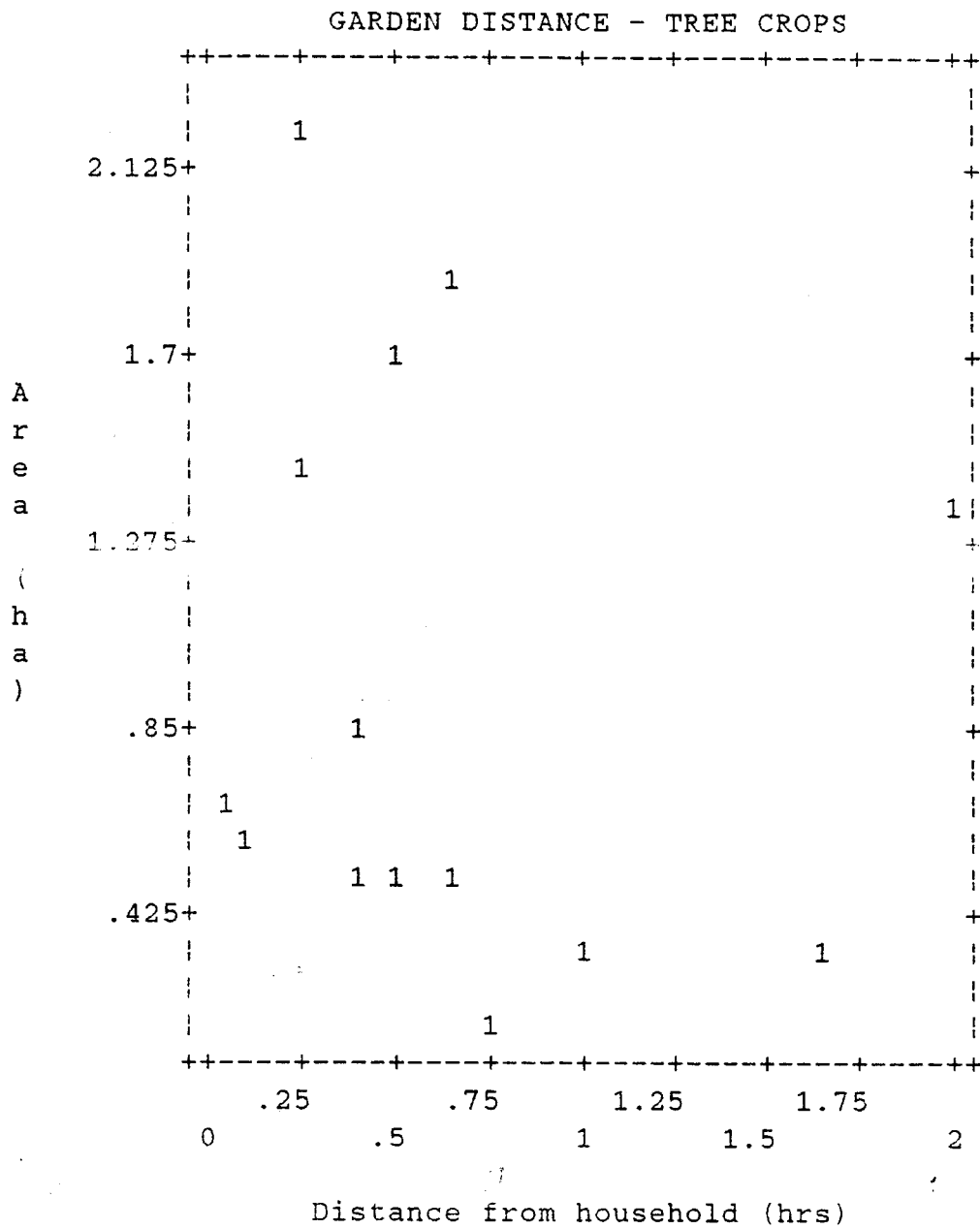
12.13 The mean time taken to reach food gardens from the household is .615 hours, with a maximum time of 2.05 hours.

Diagram: 12.2



Mean = .601 hrs  
 Max = 2.05 hrs  
 Number of observations (gardens) = 113

Diagram: 12.3

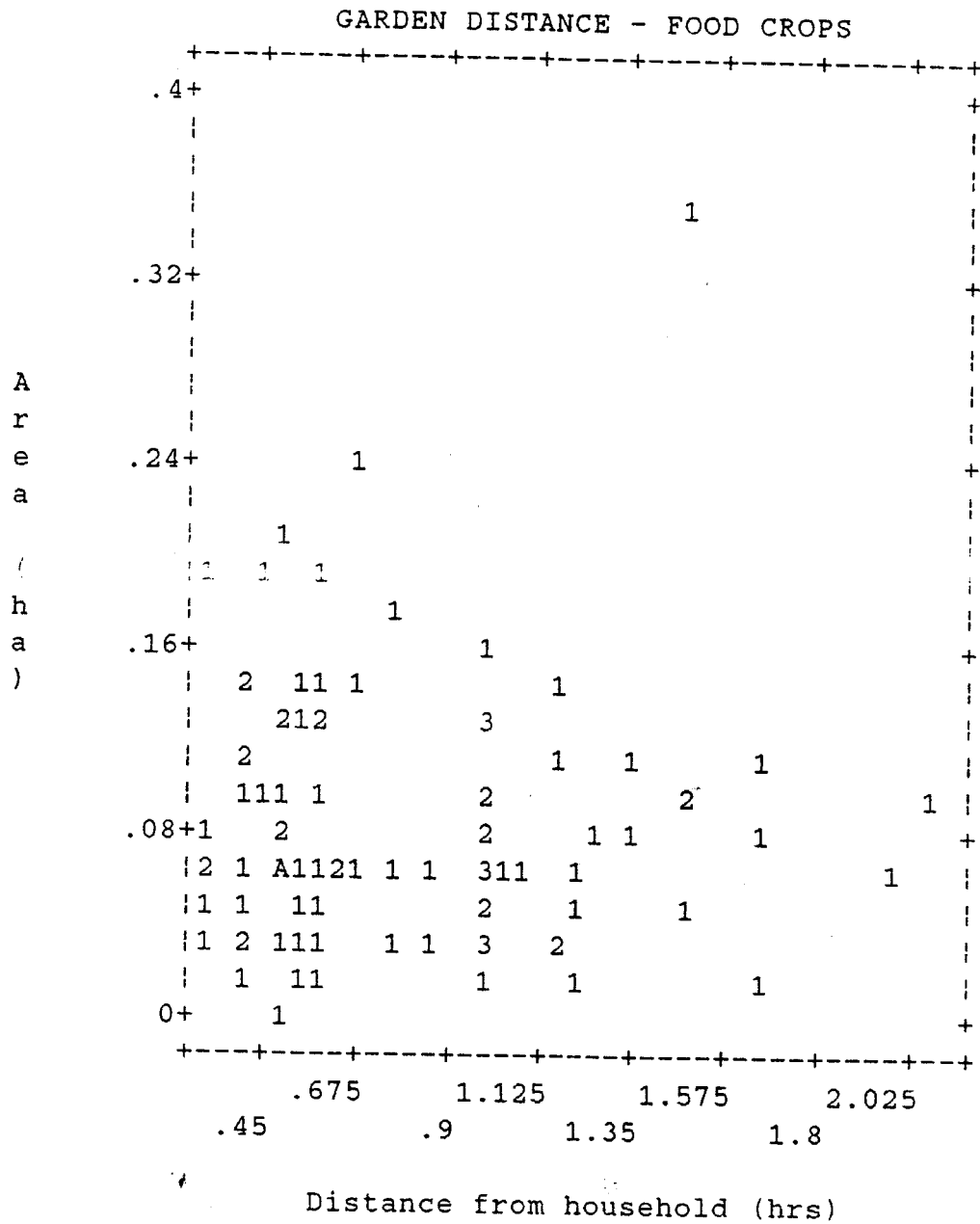


Mean = .506 hrs

Max = 2.00 hrs

Number of observations (gardens) = 14

Diagram: 12.4



Mean = .615 hrs

Max = 2.05 hrs

Number of observations (gardens) = 99

## Chapter: 13

### ADVERSE FACTORS AFFECTING PRODUCTION

13.1 Table 13.1 describes site factors which farmers regard as problems. The first part of the table specifies the number of observations (gardens), which is expressed as the proportion of cultivated area affected in the second part of the table.

Table: 13.1

#### SITE CONDITIONS

i) Site Conditions by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no site limitation		2		57	59
poor soil/site		1		3	4
pest/disease problem		2		36	38
poor site + pests					
weed problem		9		3	12
weeds + poor site					
weeds + pests					
weeds + site + pests					
total by crop type		14		99	113

ii) Site Conditions by % cultivated area

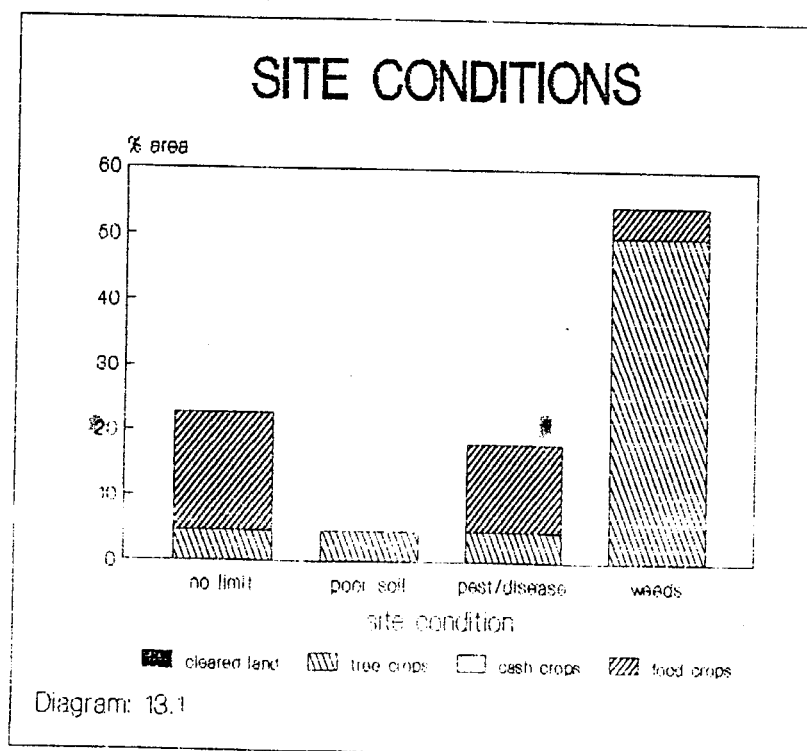
crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no site limitation		5		18	23
poor soil/site		5			5
pest/disease problem		5		14	18
poor site + pests					
weed problem		50		5	55
weeds + poor site					
weeds + pests					
weeds + site + pests					
total by crop type		64		36	100

Note: The table of % area is only approximate due to rounding small numbers

13.2 52% of all gardens (59 gardens) representing 23% of the cultivated area have no apparent site limitations. Site problems may be summarised by grouping the main factors as follows:

	<u>% gardens</u>	<u>% area</u>
No site limitations	52	23
Poor soil/site	4	5
Pests/disease	34	18
Weeds	11	55

Site conditions are illustrated in diagram 13.1.



13.3 The major problems are weeds and pests and disease. 18% of the cultivated area suffers from pest and disease damage and weeds affect 55% of the cultivated area.

13.4 Pests and disease are the major problems on food gardens while weeds is the major problem on tree crops. 36% of food gardens are affected by pest and disease problems on 39% of the food garden area. 64% of tree crop gardens extending over 79% of the tree garden area are affected by weeds.

13.5 Table 13.2 describes major physical crop damage, where cyclone damage to tree crops affects 79% of tree crop gardens and 92% of the tree crop area. 24% of food crop gardens extending over 26% of the food garden area were damaged by livestock.

Table: 13.2

CROP DAMAGE

i) Crop Damage by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no damage		3		75	78
cyclone damage		11			11
other damage				24	24
cyclone and other damage					
total by crop type		14		99	113

Note: Cyclone Namu damage to coconuts is widespread

"Other" damage is mainly pigs but also rats and to a lesser extent crabs and birds.

ii) Crop Damage by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no damage		5		29	33
cyclone damage		57			57
other damage				10	10
cyclone and other damage					
total by crop type		62		38	100

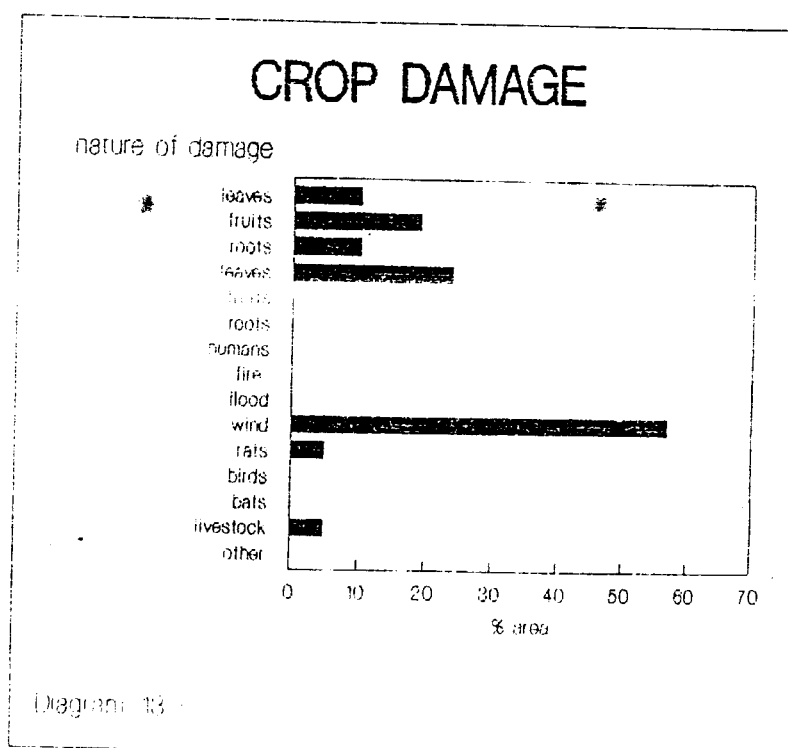
Note: The table of % area is only approximate due to rounding small numbers



13.6 Annex 3 provides a more detailed description of factors damaging crop mixtures, summarised at the plot level. It is not possible at this stage to present results at the crop level. Results are summarised in table 13.3 and are illustrated in diagram 13.2.

Table: 13.3  
SUMMARY OF CROP DAMAGE

nature of damage		% cropped area affected
insects affecting	leaves	10
	fruits	19
	roots	10
disease affecting	leaves	24
	fruits	
	roots	
damage due to	humans	
	fire	
	flood	
	wind	57
	rats	5
	birds	
	bats	
	livestock	5
	other	



## Chapter: 14

### CROP YIELDS

14.1 Production data on smallholder agriculture are scarce, largely due to practical difficulties associated with measuring yields in complex cropping systems that lack clear temporal and spatial boundaries. Smallholder agriculture is a continuous process in which there is little seasonality, so that any or all stages of crop growth and management operations may be exhibited at any time, with crops commonly harvested selectively over time. Table 14.1 summarises the planting characteristics of smallholder crops in the survey area.

Table: 14.1  
CROP VARIETY AND SPACING

<----- crop type ----->		number	*	<----- spacing (% obs) ----->			
		of	Improved	customary	regular	recommended	
		Observations				<---- tree crops ---->	
						triangular	square
Cleared	Cleared land						
Coconut/Cocoa	Coconuts	17			6	24	12
	Cocoa						
Ground crops	Grain crops	7	14				
	Beans						
	Cabbage	49					
	Vegetable						
	Chillie						
	Fruit Crops	47					
Tree/other crops	Fruit trees						
	Banana	34					
	Citrus trees						
	Nut trees	3					
	Sugar cane	23					
	Food/building tree						
	Tobacco	2					
Root crops	Sweet potato	54					
	Taro Common	68					
	Giant	18					
	Hong Kong	11					
	Swamp	1					
	Yam	56					
	Pana	50					
	Cassava	25					
	Other root crop	1					
Total		466					

14.2 The second column refers to the introduction of non-traditional planting material, either through extension or research, or from other sources.

14.3 For non-tree crops there are three types of spacing identified, being "customary", "regular" and "recommended". "Customary" means there is no discernable order in the plot. "Regular" means planting according to a visible pattern, such as in rows. "Recommended" refers to the adoption of recommended practices, which may not necessarily be "regular". For tree crops there are four categories of "customary", "regular", "triangular" and "square". "Customary" and "regular" follow the same rules as non-tree crops. "Triangular" and "square" equate with recommended practices for coconuts.

14.4 Crop mixtures in smallholder farming systems are complex, as seen in table 9.3. Table 14.2 describes something of the complexity of planting conditions. While 71% of coconut plots are pure stand, complexity is exhibited in the planting of most crops. Only 15% of sweet potato plots are pure stand; 1% of taro plots; 4% of yam plots; 4% of pana plots; and 4% of cassava plots. Crops are mostly grown in complex mixtures.

Table: 14.2  
CROP DOMINANCE IN MIXTURES

(----- crop type -----)		number of observations	(% dominance in mixture -----)									
			0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Cleared	Cleared land											
Coconut/Cocoa	Coconuts	17	12	6				6		6		71
	Cocoa											
Ground crops	Grain crops	7	100									
	Beans											
	Cabbage	49	94	4				2				
	Vegetable											
	Chillie											
	Fruit Crops	47	87	11	2							
Tree/other crops	Fruit trees											
	Banana	34	97	3								
	Citrus trees											
	Nut trees	3		67	33							
	Sugar cane	23	91	9								
	Food/building tree											
	Tobacco	2	100									
Root crops	Sweet potato	54	7	7	4	11	6	2	11	24	13	15
	Taro Common	68	44	32	9	6		3	1	1	1	1
	Giant	18	78	17	6							
	Hong Kong	11	100									
	Swamp	1		100								
	Yam	56	11	2	7	29	13	16	4	11	5	4
	Pana	50	16	16	24	22	6	6		4	2	4
	Cassava	25	64	28						4		4
	Other root crop	1	100									
Total		466										

14.5 A visual assessment of yields is presented in table 14.3.

Table: 14.3  
CROP PRODUCTION

<----- crop type ----->		number of observations	<----- yield appearance (% obs) ----->			
			zero	low	moderate	high
Cleared	Cleared land					
Coconut/Cocoa	Coconuts	17		29	65	6
	Cocoa					
Ground crops	Grain crops	7		14	43	43
	Beans					
	Cabbage	49		4	84	12
	Vegetable					
	Chillie					
	Fruit Crops	47		4	77	19
Tree/other crops	Fruit trees					
	Banana	34		3	88	9
	Citrus trees					
	Nut trees	3		33	67	
	Sugar cane	23		26	74	
	Food/building tree					
	Tobacco	2			100	
Root crops	Sweet potato	54	2	6	78	15
	Taro Common	68	1	3	79	16
	Giant	18			33	67
	Hong Kong	11			45	55
	Swamp	1			100	
	Yam	56	2	16	66	16
	Pana	50		2	78	20
	Cassava	25		8	76	16
	Other root crop	1		100		
Total		466				

14.6 Most root and vegetable crop yields are moderate to high while coconut yields are low to moderate.

14.7 In an intensive case study of this kind it is difficult to obtain a reasonable coverage of crop yields, although these are recorded where possible in the course of the survey<sup>(12)</sup>. A crop production study has been designed to generate yield data<sup>(22)</sup> but it has not been possible to implement this yet. For the present report yields are largely derived from secondary sources.

a) COCONUT:

14.8 Coconut production data from the 1974-75 agricultural survey are summarised in table 14.4.

Table: 14.4  
COCONUT PRODUCTION DATA FROM 1974-75 AGRICULTURAL SURVEY

	<----- Province ----->				Mean
	Western	Ysabel Central Guadalcanal	Malaita	Makira Temotu	Solomon Islands
number of yield sites	28	32	3	30	93
coconuts per palm: disciplined	53	54	19	34	44
customary	22	36	1	41	31
mean	31	42	14	37	36
coconuts per ha : disciplined	8,194	8,983	2,822	5,773	7,178
customary	4,658	8,595	135	7,432	6,703
mean	5,794	8,753	1,926	6,492	6,913
% damaged/unusable nuts: disciplined	12	10	12	20	14
customary	19	13	36	6	13
mean	16	12	12	13	14
gross copra yield (kg/ha): disciplined	1,541	1,689	531	1,086	1,450
customary	876	1,616	25	1,398	1,261
mean	1,081	1,646	362	1,221	1,300
net yield (kg/ha): disciplined	1,356	1,520	467	869	1,247
customary	709	1,406	16	1,314	1,097
mean	908	1,448	318	1,062	1,113

Source: Statistics Office (1978) "1974-75 Agricultural Statistics Survey".

Note: Copra yields assume 190gm dried copra per nut quoted in the Statistics Office report

14.9 In the 1974-75 agricultural survey the mean coconut yield is estimated to be 1,300kg/ha copra equivalent, or 1,118kg/ha when unusable nuts are discounted. The average daily consumption of coconuts was found to be 4.2 per household, resulting in a national annual consumption equivalent of 8,871MT copra. If green nuts are taken into account it was believed that the copra equivalent consumed would be 10,000MT<sup>(5)</sup> in a year when exports amounted to 28,000MT.

14.10 Charles (1980) estimates lower levels of copra production with estate yields of 827kg/ha and smallholder yields of 410kg/ha. The difference he attributed to a high proportion of immature plantings and the consumption of coconuts in the smallholder sector<sup>(23)</sup>. Average copra production derived from the 1985 coconut survey is estimated in the (draft) Farm Management Handbook for Solomon Islands to be 0.72MT/ha<sup>(24)</sup>, although provincial yields vary from 1.15MT/ha in Central Province, which is dominated by the Lovers plantation in the Russell Islands, to 0.38MT/ha in Temotu.

14.11 In conjunction with the 1985 coconut survey the Research Department of the Ministry of Agriculture and Lands has analysed the nutrient status of coconut soils in Solomon Islands<sup>(13)</sup>:

Coconut Soils Data:  
(means of soils analyses conducted on Coconut Survey soils)

pH	N%	avaialble P ppm	exchangeable K meq/100g	avaialble K meq/100g
6.4	0.55	70	0.24	0.60

14.12 It was concluded that coconut soils are generally high in nitrogen, medium in phosphate, and low in potassium. Recent variety experimental results on fertilised coconuts show the following yields:

Coconut Research Results (dry copra eq kg/ha):

Site	Tenaru (Guadalcanal)	Gizo (Western)
Year	1985 : 1984	1985 : 1984
Dwarf:Rennel Hybrid	378 : 2,664	1,990 : 1,599
Dwarf:Local Tall Hybrid	383 : 1,391	:
Local Tall	:	1,830 : 334
Rennel	190 : 1,391	1,910 : 1,052
Mean	:	995

14.13 No smallholder yields were obtained in the present survey and so secondary sources have to be used. While considerable damage was caused to coconut stands, yields in the present report are estimated to be 800kg/ha dry copra equivalent usable nuts, of which 350kg equivalent might be consumed.

b) COCOA:

14.14 Research trials on cocoa<sup>(13)</sup> from 1977 to 1985 at Black Post in Guadalcanal produced a mean dry beans yield of 1,898kg/ha for Amelonado, 2,780kg/ha for AmlxNa33 hybrid, and 2,444kg/ha for AmlxPa7 hybrid.

14.15 Cocoa yields from various sources are quoted in the (draft) Farm Management Handbook for Solomon Islands<sup>(24)</sup>:

Smallholder Cocoa Yields (kg/ha)<sup>(24)</sup>:

Age of tree (year)	3	4	5	6	7	8
Friend (1970)	21	126	215	220	220	173
DBSI (1983) *	150	250	600	1,200	1,450	1,450
Hiele (1988)	208	450	560	685	719	719

\* unverified source



14.16 High variability in yields was attributed to differences in management, such as in the application of fertiliser, weeding, and pest and disease control.

14.17 No cocoa was encountered in the survey area and so no yields were obtained. Smallholder cocoa yields are estimated in the present report to be 600kg/ha dry beans.

c) SWEET POTATO:

14.18 In a study of north-west Malaita, Frazer<sup>(15)</sup> investigated the effect of fallow period on smallholder sweet potato yields. After a long fallow of 15-20 years the mean yield was found to be 14.84MT/ha from 8 observations. After a "short" fallow of less than 10 years the mean yield was 8.99MT/ha from 5 observations. Gollifer<sup>(16)</sup> looked at the effects of potassium and nitrogen application on annual crops on soils of the Dala Series in Malaita, soils formed on a parent material of raised coral reef and characteristically low in potassium. He found unfertilised sweet potato yields of 5.5MT/ha (control for K) and 7.4MT/ha (control for N). The effect of potassium application was to increase yields by up to 86%, but nitrogen tended to stimulate vine growth at the expense of the tuber.

14.19 In a series of trials at Dala, Gollifer<sup>(17)</sup> found unfertilised sweet potato yields to range widely, from around 0.25MT/ha to 24MT/ha. Yields in general were the order of 5MT/ha, which was estimated to be around half the typical North West Guadalcanal yield of 9.97MT/ha. Yield variability could not be attributed to variety or soil type, but a trend related to intensity of cropping did appear:

Effect of Recent Land History on Sweet Potato Yields (MT/ha):

land history	yield (MT/ha)
continuous cropping	3.51
0 - 4 years fallow	4.77
5 - 9 years fallow	6.03
more than 10 years fallow	9.29

Source: Gollifer (1969)

14.20 It was concluded that sweet potato and other root crops are demanding of, and remove large quantities of, potassium from the soil. A fallow-burn cycle is therefore essential to replenish soil fertility by making potassium available to shallow-rooted crops. It was considered that deep rooting trees may act as nutrient pumps, but the only practical way of shortening fallow periods was considered to be the application of potassium fertiliser<sup>(17)</sup>.

14.21 Bathgate<sup>(18)</sup> found also that yields vary according to soil fertility and growing time, as well as species and density of planting. In West Guadalcanal he quotes sweet potato yields of 7.16MT/ha after 20 years of fallow and 9.36MT/ha after 8 years of fallow, but based on a single sub-plot observation only in each case.

14.22 On the weather coast of Guadalcanal Chapman and Pirie<sup>(19)</sup> studied the relationship between yields and cropping, and found yields to be high in comparison to studies elsewhere:

Sweet Potato Yield (MT/ha) - Weather Coast, Guadalcanal

successive crops	Ghauvalisi	Sughu	Hatare/Poinaho
1	41.67	18.08	17.82
2	15.31	10.54	9.79
3		10.29	9.79

Source: Chapman and Pirie (1974)

14.23 In the 1974-75 Agricultural Survey<sup>(5)</sup> the mean yield of sweet potato was 15.7MT/ha, but this was felt to be an over-estimate.

14.24 More recent research provide further information on sweet potato yields, but results exhibit considerable variability across seasons and due to other causes:

trial	yield MT/ha		notes
	gross	marketable	
improved cultivars	17.9	14.5	25 obs
control	11.2	6.7	1 obs
dry season corn intercropping	15.9	7.1	135 days to harvest
	18.5	12.0	165 days to harvest
wet season corn intercropping	5.3	2.0	135 days to harvest
	11.0	3.4	165 days to harvest
dry season weevil control	15.3		no effect from insecticide
wet season weevil control	8.19	6.37	

Source: Research Department Annual Report 1984<sup>(14)</sup> and 1985<sup>(13)</sup>

14.25 Two yield observations were made on sweet potato during the present survey with a mean yield of only 3,326kg/ha.

14.26 Smallholder sweet potato yields of usable crop are estimated in the present report to be 8MT/ha under long fallow of 8 years or more - falling to 5MT/ha for fallow of 4 to 8 years, and 3.5MT/ha for short fallow cropping.

#### d) TARO:

14.27 Taro yields in the literature are highly variable. Frazer<sup>(15)</sup> found Colocasia esculenta to yield 8.94MT/ha in North Malaita, based on 10 observations. Gollifer<sup>(16)</sup> on the Dala Series in Malaita found yields of 4.0MT/ha for unfertilised taro, which increased to 6.0MT/ha with 168kg/ha potassium fertiliser applied. Gollifer<sup>(17)</sup> also quotes widely ranging unfertilised taro yields of 1.00 to 10.80MT/ha on experimental plots. In a spacing trial in Guadalcanal at Tenaru on which fertiliser was applied, the net undamaged taro yield for densities of 2,000 to

4,000 plants/ha was around 5MT/ha, with 30% loss due to corm damage<sup>(14)</sup>. On the same site a high intensity inputs and management trial to investigate leaf blight yielded around 9MT/ha marketable corms<sup>(14)</sup>. The control yield in a 1985 taro beetle trial at Tenaru was 3.49MT/ha<sup>(13)</sup>. Tioti (1967) estimated taro yields to be 12.6MT/ha<sup>(25)</sup>, but Gollifer (1970) quotes yields of 4.7MT/ha<sup>(26)</sup>.

14.28 No yields were obtained in the present survey but smallholder taro yield in the present report is estimated to be 5MT/ha.

e) YAM:

14.29 In North Malaita Frazer<sup>(15)</sup> found yam yields of 5.16MT/ha for *Dioscorea alata*. Gollifer<sup>(17)</sup> quotes unfertilised yam yields of 6.03MT/ha to 30.38MT/ha at Dala experimental station on Malaita. In 1984 an experiment to compare the yields of 18 yam cultivars was conducted at Tenaru in Guadalcanal<sup>(14)</sup> in which the cultivars with high resistance to dieback yielded around 14 to 18MT/ha, with the highest resistance cultivar yielding 24MT/ha. Susceptible cultivars produced yields as low as 2MT/ha. Maeinia<sup>(27)</sup> quotes very high yields of 50 - 63MT/ha for Malaita.

14.30 Smallholder yam yields are likely to be higher than those of sweet potato given that they tend to be planted on newly opened sites and the yield appearance is generally good. Four yield were obtained in the survey, with a mean yield of 9.066kg/ha. In the present report long term fallow is expected to yield 10MT/ha, fallow of 4-8 years to yield 6MT/ha and short fallow systems to yield 4MT/ha.

f) PANA:

14.31 Frazer<sup>(15)</sup> quotes a for North Malaita, where on one observation only of Dioscorea esculenta produced a yield of 11.52MT/ha. Fertilised cultivar trials at Dodo Creek Research Station<sup>(14)</sup> in 1984 yielded 16.2MT/ha marketable tubers out of a total yield of 27.7MT/ha. 1983 results were higher, with 43.7MT/ha marketable tubers out of a total yield of 52.9MT/ha. The difference was believed to be due to inadequate fertiliser in 1984. In 1985 the mean fertilised yield of 8 cultivars was 24.3MT/ha marketable tubers<sup>(13)</sup>.

14.32 Three pana yields were obtained with a mean yield of 8,666kg/ha. Smallholder pana yields in the present report are expected to be similar to yam yields - of 10MT/ha under long fallow, 6MT/ha under 4-8 years fallow, and 4MT/ha under short fallow.

g) CASSAVA:

14.33 Fertilised cassava in a time of harvest trial at Dodo Creek in Guadalcanal<sup>(13)</sup> yielded 23.8MT/ha after 9 months and 27.8MT/ha after 12 months. In a fertilised germplasm collection trial on the Fataolo land system on Malaita<sup>(17)</sup> 17 cultivars ranged from 7.5 to 65.8MT/ha, with 50% above 40MT/ha<sup>(28)</sup>.

14.34 Smallholder cassava is generally planted on less fertile sites and is commonly a minor crop in a mixture. It is high yielding, although of low nutritional value. Smallholder yields in the present report are estimated to be 10MT/ha.

h) MAIZE:

14.35 Gollifer<sup>(16)</sup> quotes unfertilised maize yields of 1.90MT/ha on Dala soils in Malaita, but yields of 5.58MT/ha when fertilised with NPK. Further unfertilised maize yield data from Dala<sup>(17)</sup> range from 1.55MT/ha to 2.13MT/ha.

14.36 Smallholder maize yields in the present report are estimated to be 1.8MT/ha.

i) GROUNDNUT:

14.37 Gollifer quotes unfertilised groundnut yields in the range 527kg/ha to 1,278kg/ha from Dala in Malaita.

14.38 Smallholder groundnut yields in the present report are estimated to be 600kg/ha.

k) SUMMARY OF YIELDS:

14.39 Crop yields derived from the survey and secondary sources are necessarily imprecise because of the complexity of smallholder farming systems. Diverse crop mixtures, with varying crop densities and differing site conditions do not lend themselves to a simple analysis of crop yields or smallholder production. Crop yields in the literature are generally for pure stand crops, or very simple mixtures - under controlled or even modified conditions. There is then a need to study smallholder production under more realistic conditions, as is part of the on-going programme of the Agricultural Economics Section. In the meantime, a "best estimate" of typical smallholder yields in the project area is presented in table 14.5.

Table 14.5  
SMALLHOLDER CROP YIELDS

crop	condition	yield kg/ha
coconut	copra equivalent	800
cocoa	dry beans	600
sweet potato	> 8 years fallow	8,000
	4 - 8 years fallow	5,000
	< 4 years fallow	3,500
taro		5,000
yam	> 8 years fallow	10,000
	4 - 8 years fallow	6,000
	< 4 years fallow	4,500
pana	> 8 years fallow	10,000
	4 - 8 years fallow	6,000
	< 4 years fallow	4,500
cassava		10,000
maize		1,800
groundnuts		600

## Chapter: 15

### SMALLHOLDER PRODUCTION

15.1 Under the Rural Services "Project Beneficiary Monitoring and Evaluation" undertaken by the Statistics Office, gross crop offtake and other primary production were measured. Unpublished provisional results, courtesy of the Statistics Office, are presented in table 15.1.

Table: 15.1  
DAILY SMALLHOLDER PRODUCTION

Average daily production from entire household (kg):

Commodity	Province and Site						
	Ysabel	Central	Guadalcanal	Malaita	Makira	Temotu	Average
	Susubona	Hakama	Marau Sound	Afio	NW Peninsula	Lata	
sweet potato	8.00	2.67	6.68	3.79	4.09	4.19	4.90
cassava	1.26	0.98	2.15	0.35	0.63	0.04	0.90
yam	0.68	1.68	0.71	2.25	0.65	0.90	1.14
pana	0.58	4.60	0.32	0.06	0.34	0.12	1.00
taro	0.71	0.32	0.45	1.60	1.37	1.15	0.93
breadfruit	0.01		0.03	0.01		0.11	0.03
banana	0.55	0.56	1.85	0.83	2.06	0.28	1.02
sub-total	11.79	10.80	12.20	8.90	9.13	6.78	9.93
coconut	0.44	0.49	3.55	1.41	2.54	0.43	1.48
cabbage	0.24	0.26	0.40	0.75	0.71	0.32	0.45
other veg	0.29	0.12	0.24	0.05	0.37	0.08	0.19
other fruit	0.91	0.31	2.01	0.89	1.90	0.41	1.07
fresh meat			0.01		0.01	0.03	0.01
fresh fish	0.69	0.40	0.57	0.32	0.25	0.12	0.39
crab/shellfish	0.58	0.20	0.13	0.23	0.02	0.05	0.20
milk/eggs	0.01				0.00		0.00
betel nut	0.09	0.08		0.16	0.06	0.11	0.08
local tobacco		0.03			0.01	0.01	0.01

Based on observations from the following number of "household days":

1,200	960	480	840	1,200	720	900
-------	-----	-----	-----	-------	-----	-----

Source: Statistics Office PBME unpublished results.



15.2 On average there are 9.93kg of staple crops produced daily, the crop composition varying according to area and season. Given a national mean household size of 6.50 from the 1986 population census this would provide each man, woman and child with approximately 1.5kg of staple per day.

15.3 The average household daily production of cabbage is 0.45kg, other vegetables 0.19kg and fruit 1.07kg. Only 0.01kg of fresh meat is consumed daily in comparison with 0.39kg (whole) fresh fish and 0.20kg crabs and shellfish. National coconut consumption is estimated to be 1.48kg husked unshelled nuts per day, which amounts to an average consumption of 4.26 nuts per household per day according to the mean nut weights in the survey.

15.4 Results from table 15.1 are transformed into annual production in table 15.2 using the simplifying assumption that the survey period is representative of the rest of the year. This is only a first approximation of smallholder yields.

Table: 15.2  
ANNUAL SMALLHOLDER PRODUCTION

Average annual production from entire household (kg):

commodity	Province and Site						
	Ysabel	Central	Guadalcanal	Malaita	Makira	Temotu	Average
	Susubona	Hakama	Marau Sound	Afio	NW Peninsula	Lata	
sweet potato	2,919 :	974 :	2,439 :	1,382 :	1,492 :	1,528 :	1,78
cassava	460 :	357 :	786 :	129 :	231 :	15 :	33
yam	247 :	612 :	260 :	823 :	236 :	329 :	41
pana	212 :	1,677 :	116 :	23 :	123 :	44 :	36
taro	259 :	117 :	163 :	584 :	501 :	419 :	34
breadfruit	3 :		12 :	4 :		39 :	1
banana	201 :	204 :	674 :	304 :	750 :	101 :	372
sub-total	4,302 :	3,942 :	4,451 :	3,249 :	3,333 :	2,474 :	3,625
coconut (kg)	159 :	179 :	1,295 :	515 :	929 :	156 :	539
(nuts)	88 :	94 :	145 :	274 :	261 :	117 :	163
cabbage	88 :	94 :	145 :	274 :	261 :	117 :	163
other veg	107 :	43 :	87 :	17 :	136 :	28 :	70
other fruit	331 :	112 :	735 :	325 :	692 :	150 :	391
fresh meat			3 :				
fresh fish	250 :	145 :	208 :	117 :	4 :	10 :	3
crab/shellfish	211 :	72 :	49 :	36 :	90 :	44 :	142
milk/eggs	2 :				7 :	19 :	74
betel nut	34 :	27 :		57 :	20 :	41 :	30
local tobacco		9 :			4 :	3 :	3

15.5 From table 9.2 the average root crop area in the survey area is 0.206ha of which sweet potato is dominant on 0.070ha, taro on 0.005ha, cassava on 0.001ha, pana on 0.018ha and yam on 0.112ha. These crops occur in complex mixtures, so that simple cropping patterns can only be used as a first approximation for the actual crop coverage.

15.6 Table 15.3 is a summary of available production data from the farming systems survey and the PBME exercise. It is not possible to directly relate aggregate production data to average cropping patterns until a more detailed analysis of smallholder production is available.

Table: 15.3

SMALLHOLDER PRODUCTION SUMMARY

commodity	area (ha)	growing period (months)	annual production (kg)
sweet potato	0.070	4.5	1,382
cassava	0.001	8.0	129
yam	0.112	7.1	823
pana	0.018	7.4	23
taro	0.005	6.8	584
breadfruit			4
banana			304

Source table:                      9.2                      11.3                      15.2

## Chapter: 16

### LABOUR

16.1 With little or no cash inputs applied the main component in the socio-economy of smallholder agriculture is labour. Table 16.1 presents an overview of labour constraints expressed by farmers. The first part of the table shows the frequency of gardens affected and is expressed in terms of area affected in the second part. Labour constraints are illustrated in diagram 16.1.

Table: 16.1  
LABOUR CONSTRAINTS

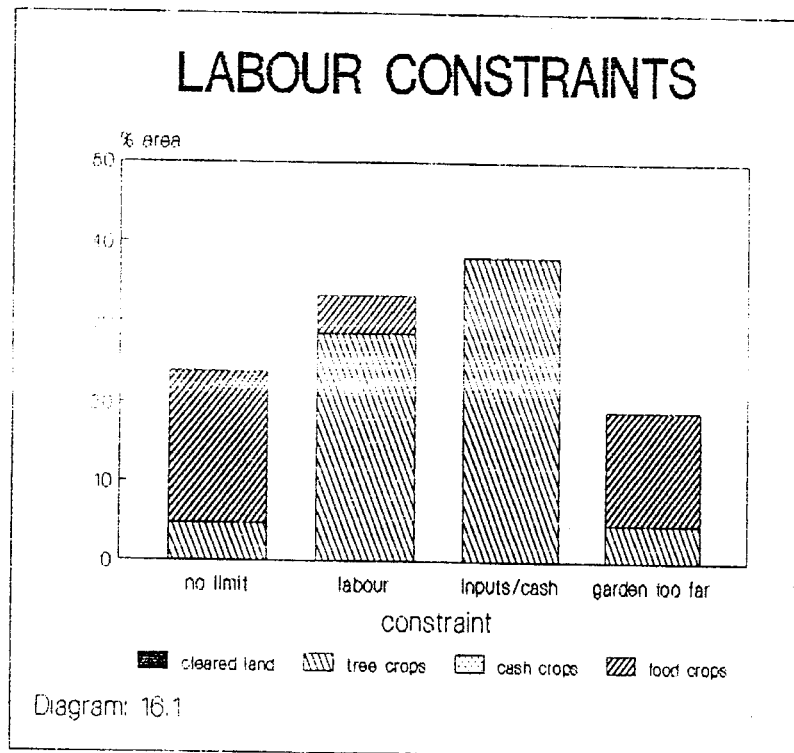
i) Labour Constraints by number of observations (gardens)

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no limitation		1		52	53
lack of labour		4		6	10
lack of inputs/cash		6			6
lack of labour + cash		1			1
garden too far from house				41	41
garden too far + labour					
garden too far + cash		2			2
too far + labour + cash					
total by crop type		14		99	113

ii) Labour Constraints by % cultivated area

crop type:	cleared land	tree crops	short term cash crops	food crops	all crops
no limitation		5		19	24
lack of labour		19		5	24
lack of inputs/cash		24			24
lack of labour + cash		10			10
garden too far from house				14	14
garden too far + labour					
garden too far + cash		5			5
too far + labour + cash					
total by crop type		62		38	100

Note: The table of % area is only approximate due to rounding small numbers



16.2 The dominant constraints are on tree crops. A labour shortage is recorded on 47% of the tree crop area, while a shortage of inputs or cash is recorded on 63% of the area. 14% of tree crop gardens, on 8% of the tree crop area, are too far from households. In contrast 6% of food crop gardens on 13% of the food crop area have a shortage of labour, but distance of gardens from households is a problem on 41% of food crop gardens on 37% of the food crop area.

Table: 16.2

## ANNUAL LABOUR INPUT BY HOLDING

	<----- work days per year ----->					<- % contribution ->			labour cost (SIS)
	<----- per holding ----->				per ha	men	women	paid	
	men	women	paid	total	average				
i) Land Clearance									
Cleared Land					239				
Coconut	17	14	1	32	96	53	44	3	1
Fruit Crops					369				
Sweet Potato	8	10	1	19	263	42	53	5	1
Taro					134				
Yam	8	13	1	22	194	36	59	5	1
Pana	1	3		4	189	25	75		
Total holding	34	40	3	77	205	44	52	4	3
ii) Cultivation									
Cleared Land									
Coconut	11	11	1	22	50	55	54		
Fruit Crops					54				
Sweet Potato	4	6		10	148	40	60		1
Taro					77				
Yam	5	7		12	102	42	58		
Pana	1	2		3	131	33	67		
Total holding	30	26	1	57	119	53	46	2	2
iii) Planting									
Cleared Land									
Coconut	12	8		20	62	60	40		
Fruit Crops					79				
Sweet Potato	2	6		8	120	25	75		
Taro					68				
Yam	2	6		8	73	25	75		
Pana		1		1	82		100		
Total holding	15	21		37	88	43	57		

# ANNUAL LABOUR INPUT BY HOLDING (continued)

	<----- work days per year ----->				<- % contribution ->			labour	
	<----- per holding ----->				per ha				cost
	men	women	paid	total	average	men	women	paid	(SIS)
iv) Establishment									
Cleared Land									
Coconut			3	3	9			100	2
Fruit Crops									
Sweet Potato									
Taro									
Yam									
Pana									
Total holding			3	3	9			100	2
v) Maintenance									
Cleared Land									
Coconut	11	0		16	81	1	19		
Fruit Crops									
Sweet Potato	3	3		6	99	50	50		
Taro									
Yam									
Pana									
Total holding	16	6		22	70	73	27		
vi) First Weeding									
Cleared Land									
Coconut	7	7		14	43	50	50		1
Fruit Crops									
Sweet Potato	2	5		7	104	29	71		
Taro					77				
Yam	1	7		8	73	13	88		
Pana		3		3	146		100		
Total holding	10	22		32	85	31	69		1

# ANNUAL LABOUR INPUT BY HOLDING (continued)

<----- work days per year ----->      <- % contribution ->      labour  
 <----- per holding ----->      per ha      cost  
 men   women   paid   total   average   men   women   paid   (SIS)

## vii) Second Weeding

Cleared Land									
Coconut	4	3	1	8	36	50	38	13	4
Fruit Crops									
Sweet Potato	2	1		3	84	67	33		
Taro					43				
Yam		2		2	37		100		
Pana									
Total holding	6	6	1	13	52	46	46	8	4

## viii) Third Weeding

Cleared Land									
Coconut	7	1		2	10	71	11		1
Fruit Crops									
Sweet Potato		1		1	20		100		
Taro									
Yam		2		2	30		100		
Pana									
Total holding	7	5		12	40	53	42		1

## ix) Harvesting

Cleared Land									
Coconut	8	24		32	98	25	75		
Fruit Crops									
Sweet Potato	2	11		13	183	15	85		
Taro									
Yam	4	7		11	102	36	64		
Pana									
Total holding	14	42		56	129	25	75		



16.6 A high proportion of labour is expended on land preparation for and the planting of coconuts following widespread damage from Cyclone Namu. Coconuts account for 42% of the labour expended in land clearance, requiring 32 work days per year. Root crops account for a further 58% of labour expended, mainly on sweet potato and yam. Of 77 work days, men contribute 44%, women 52% and paid labour accounts for 4%.

16.7 Coconuts account for 56% of the labour expended on cultivation, requiring 32 work days. A further 10 work days are required on sweet potato, 12 days on yams and 3 days on pana. Of 57 work days per year men contribute 53%, women 46% and hired labour accounts for 2%.

16.8 54% of the labour expended in planting is on coconuts, accounting for 20 work days per year, with a further 8 work days on sweet potato, 8 days on yam and 1 work day on pana. Of 37 work days per year required on planting men contribute 43% while women contribute 57%.

16.9 Labour is hired for 9 days of work on the establishment of coconut stands and 22 days per year are expended on the maintenance of coconut and young coconut in sweet potato plots. 73% of labour expenditure on maintenance is from men and 27% from women.

16.10 32 work days are spent on the first weeding of crops, of which 14 days are accounted for by coconuts, 7 days by sweet potato, 8 by yam and 3 days by pana. Labour is predominantly supplied by women, who contribute 69% of the labour on first weeding compared with 31% from men.

16.11 13 work days are spent on the second weeding of crops, of which 8 days are on the brushing of coconuts, 3 days on sweet potato and 2 days on yam. Men provide 46% of the labour on second weeding, women provide 46% and hired labour accounts for 8%.

16.12 12 work days are spent on the third weeding of crops, mainly in the brushing of coconuts which accounts for 9 days. Men provide 58% of the labour and women provide 42%.

16.13 56 work days are spent on harvesting, mostly by women and mostly on coconuts. Men account for 25% of labour in harvesting compared with 75% from women.

16.14 Overall men provide 43% of labour, women provide 54%, and 3% of the labour budget is accounted for by hired labour at an average annual cost of SI\$13.

16.15 Table 16.3 presents a summary of labour by crop and by operation

16.16 Overall there are 309 work days per year required on an "average" holding of which 133 are provided by men, 168 by women and 8 by paid labour. The average adult man in the household spends 86 days working on the holding and the average adult woman spends 94 days.

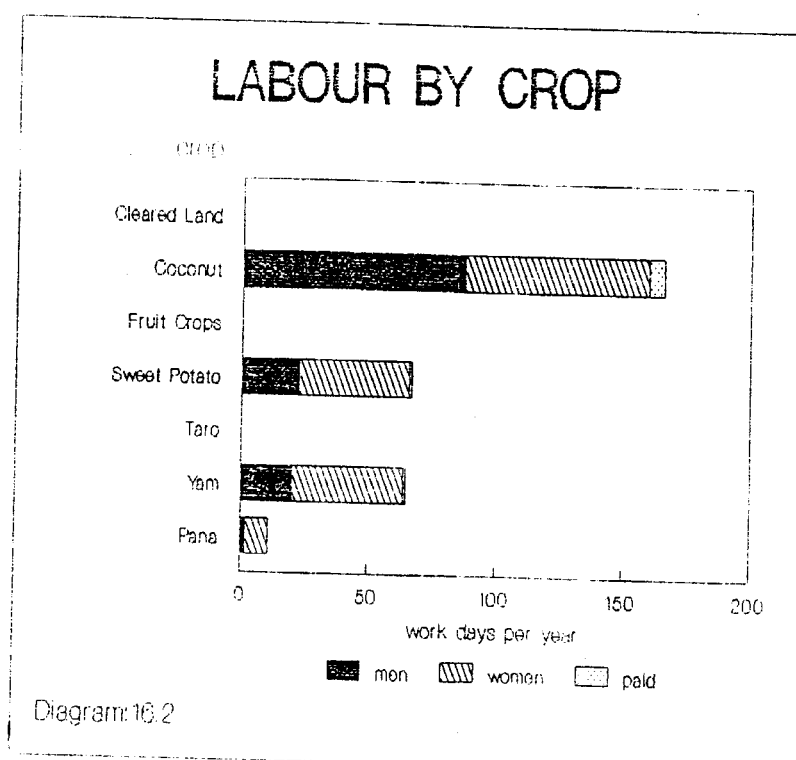
16.17 Low labour levels are explained by the small holding sizes encountered in the survey area.

Table: 16.3

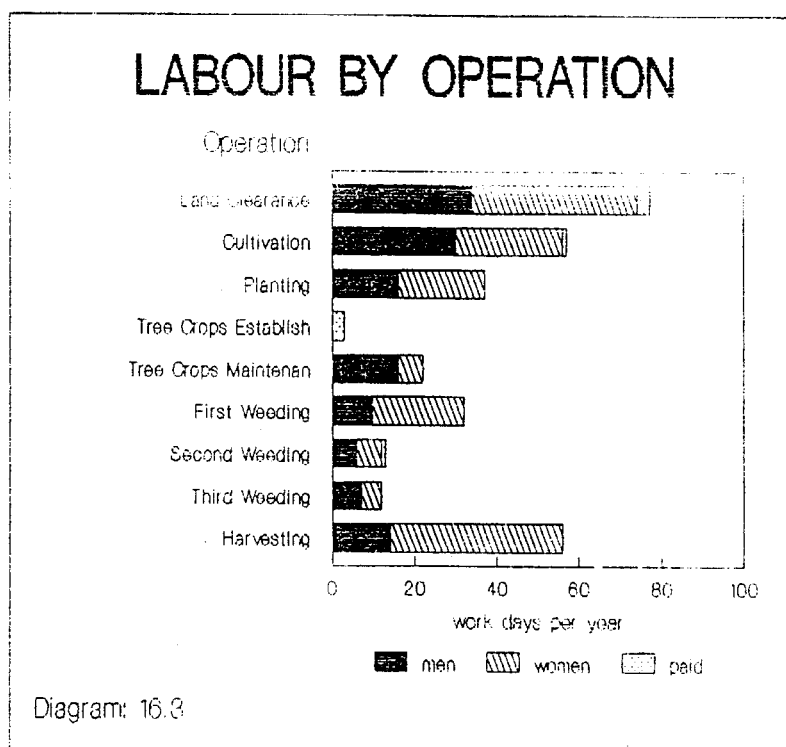
## SUMMARY OF LABOUR INPUT

	<----- work days per year ----->					<- % contribution ->			labour cost (SIS)
	<----- per holding ----->				per ha	men	women	paid	
i) By Crop	men	women	paid	total	average				
Cleared Land									
Coconut	88	72	6	166	542	53	43	4	10
Fruit Crops					502				
Sweet Potato	23	43	1	67	1021	34	64	1	2
Taro					399				
Yam	20	44	1	65	611	31	68	2	1
Pana	2	9		11	548	18	82		
All Crops	133	168	8	309		43	54	3	13
ii) By Operation									
Land Clearance	34	40	3	77		44	52	4	3
Cultivation	30	26	1	57		53	46	2	2
Planting	16	21		37		43	57		
Tree Crops Establishment			3	3				100	2
Tree Crops Maintenance	16	6		22		73	27		
First Weeding	10	22		32		31	69		1
Second Weeding	6	6	1	13		46	46	8	4
Third Weeding	7	5		12		58	42		1
Harvesting	14	42		56		25	75		
All Operations	133	168	8	309		43	54	3	13
Available labour units	:1.55	1.79							
Days per unit labour	: 96	94	8						

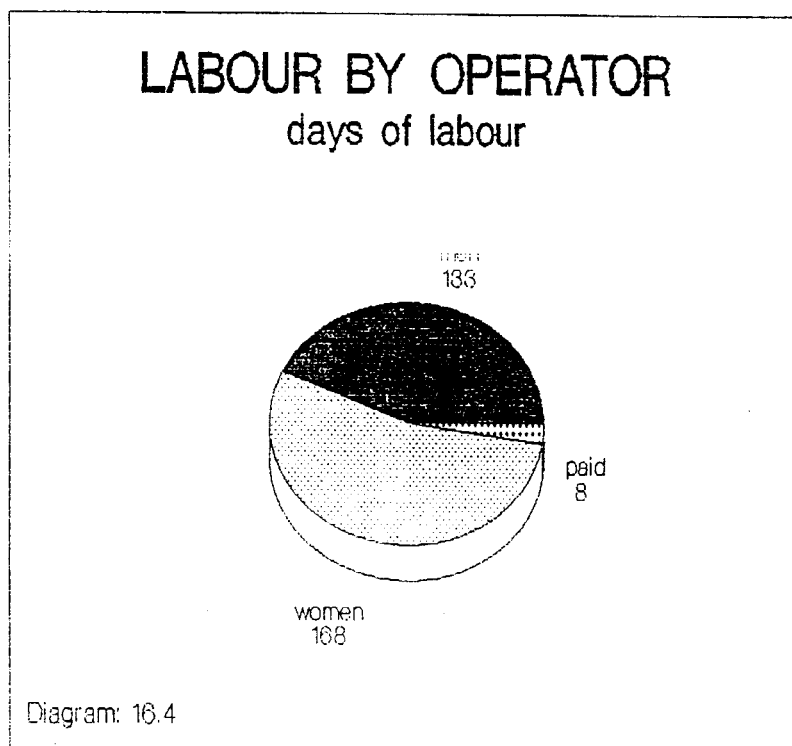
16.18 Labour by crop is illustrated in diagram 16.2. Coconut accounts for 54% of the holding labour budget as a result of Cyclone Namu damage. Sweet potato accounts for 22%, yam 21% and pana 4%. Overall food crops account for 46% of the annual labour budget, although minor adjustments could be made to take account of labour on crops not recorded in the study.



16.19 Labour by operation is illustrated in diagram 16.3. Men and women share most operations although women contribute most labour in particular on harvesting.



16.20 Diagram 16.4 illustrates the contribution from men, women and hired labour. Men contribute 43% of labour on farm, women provide 54% and paid labour accounts for 3%.



## Chapter: 17

### CROP AND FARM BUDGETS

17.1 It is not possible at this stage to produce comprehensive crop and farm budgets because of the complexity and diversity of cropping patterns, and production data are as yet incomplete. The main elements are available and a summary of information on cropping patterns, production and labour is presented in Table 17.1.

Table: 17.1  
ELEMENTS OF A FARM BUDGET

main crop in mixture	area (ha)	annual production (kg)	annual labour	
			work days	cost (\$IS)
a Cleared Land				
b Coconut	0.330	515	166	10
c Cocoa				
z Coconut and Cocoa				
d Pasture				
e Grain Crops				
f Beans				
g Cabbage	0.001	274		
h Vegetables		17		
i Spices				
j Fruit Crops	0.001	325		
k Fruit trees				
l Banana		304		
m Citrus trees				
n Nut trees		57		
o Sugar cane				
p Food/building tree		4		
q Tobacco				
r Sweet Potato	0.070	1,382	67	2
s Taro	0.005	584		
t Yam	0.112	823	65	1
u Pana	0.018	23	11	
v Cassava	0.001	129		
w Other root crop				
Total	0.537		309	13
Table reference	9.2	15.2	16.3	16.3

## Chapter: 18

### CASH CROP PROCESSING

18.1 Table 18.1 presents a labour budget for the production of copra based on only one observation. Very little copra is made as a result of Cyclone Namu damage. The labour composition is mainly family with an annual labour expenditure of 32 work days to produce 240kg copra, or one work day per 8kg copra produced.

18.2 15 work days are spent on picking and shelling the nuts which account for 47% of the total production time. Firewood collection takes 7 days or 22% of the time and drying, bagging and transport take 6 days or 19% of the total production time. The annual labour input is illustrated in diagram 18.1.

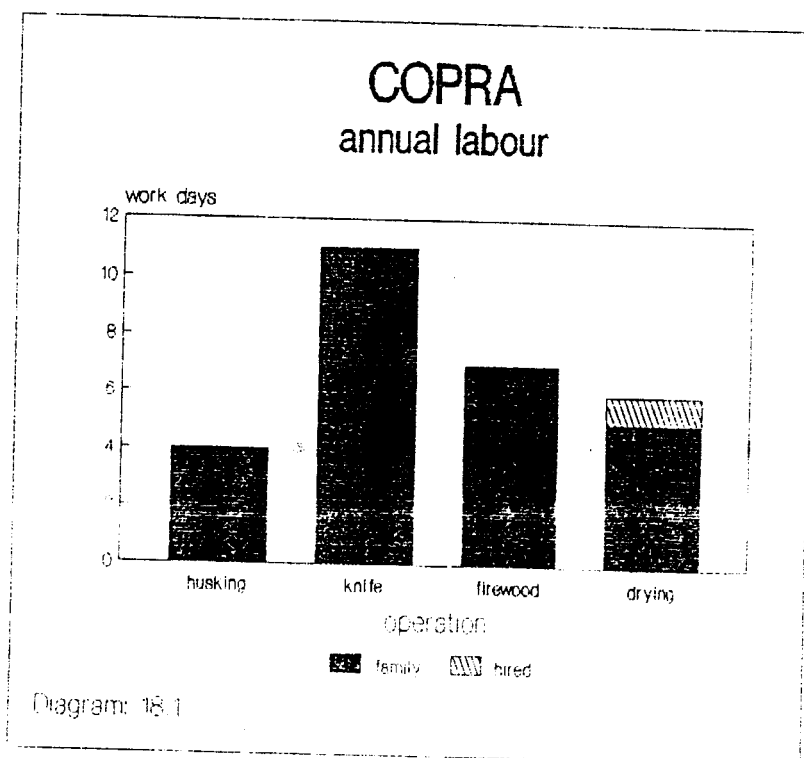




Table: 18.1

## ANNUAL COPRA PRODUCTION AND LABOUR EXPENDITURE

Annual Labour Expenditure		family or shared labour		hired labour		total	% labour by operation
		work hours	work days	work days	cash cost (\$/c)	work days	
HUSKING	picking, heaping	20.0	4.0			4.0	13
	husking						
	transport						
	breaking						
	shelling						
total		20.0	4.0			4.0	13
COPRA KNIFE	picking, heaping	20.0	4.0			4.0	13
	axing + copra knife	24.0	4.0			4.0	13
	transport	6.0	3.0			3.0	9
	total	50.0	11.0			11.0	34
FIREWOOD	collection	18.0	3.0			3.0	9
	transport	12.0	3.0			3.0	9
	collection + transport	2.0	1.0			1.0	3
	total	32.0	7.0			7.0	22
DRYING	drying	10.0	2.0			2.0	6
	bagging	6.0	3.0			3.0	9
	transport			1.0	20.00	1.0	3
	total	16.0	5.0	1.0	20.0	6.0	19
TOTAL		118.0	27.0	1.0	20.0	28.0	100
% labour by type of labour		97		3		100	

copra grade	quantity of copra produced (kg)	
	per annum	per work day
Grade 1	240	9
Grade 2		
Grade 3		
Ungraded		
total	240	9

Number of observations = 1

18.3 The gross margin for copra production is summarised in table 18.2. From an annual production of 240kg valued at the prevailing price of 33 cents per kilo the gross return is SI\$79. Inputs costs from bags and twine amount to SI\$4.08 and labour costs are SI\$20.00. The net income is SI\$55 which, at a requirement of 27 household labour days, represents a net return to labour of SI\$2.04 per household work day.

Table: 18.2  
COPRA GROSS MARGIN

Annual production (kg)	240
Price per kilogram (SI\$)	0.33
Gross return (SI\$)	79
Inputs cost (SI\$)	4.08
Labour cost (SI\$)	20.00
Net return (SI\$)	55
Household labour days	27
Copra production per household work day (kg)	9
Net return per household work day (SI\$)	2.04

Inputs costs: Sacks @ SI\$1.00 per new sack;

Average packed weight 70kg = 4 sacks = SI\$4.00.

Twine @ SI\$1.00 per hank of 50 strings = SI\$0.08.

18.4 There is no cocoa production among sampled farmers.

## Chapter: 19

### MARKETING

19.1 Table 19.1 presents a summary of marketing data collected in the survey, listing crops marketed against the number of observation recorded. The mean weight marketed is recorded, the time taken to go to market and back, the number of times the commodity is marketed per year, and the number of people involved in marketing. These are grouped under the heading of "marketing" details.

19.2 Marketing costs are recorded under the headings of freight or transport costs, fares for people involved in marketing, and market tax which may be imposed at the point of sale.

19.3 Revenues are possible where wages are earned, for instance from selling other farmers' produce and from the sale of crops. It is often difficult for sellers to specify costs and revenues, and in such cases data have to be treated as "missing". Thus the number of observations for crop sales may be lower than those for marketing data.

19.4 Table 19.2 is a transformation of the raw marketing data into an "average" annual marketing budget. The data are incomplete because of difficulties in recalling weights sold and marketing revenues. It is presented not as a model marketing budget, but as a data set to provide as much information on marketing as possible, albeit with gaps.

19.5 The two right-most columns show the net marketing revenue by crop and by household. The "net marketing revenue by crop" is the net return from sales after deducting costs. It is not the average income from crop sales since revenue may be negative where income data are missing or as a result of the double counting of transport costs when freight expenses are shared among several crops.

19.6 The "net marketing revenue per household" is the average household earnings taking account of the proportion of households selling each type of crop, but based on the limitations of the crop revenue data.

Table: 19.1  
MARKETING TIME AND CROP PRICES

Basic Marketing Data:

Basic Marketing Data:		(----- marketing -----)				(----- costs -----)			(--- revenues ---)			
		number of obs	mean weight marketed	time to market and back per year	times marketed per year	number of people	freight/ of transport cost	fares for people	market tax	wages earned	crop sale price	crop sale obs
		(obs)	(kg)	(days)	(times)	(people)	(SIS)	(SIS)	(SIS)	(SIS)	(\$/kg)	(obs)
ALL CROPS	Average	33	267	1.1	8	2		0.03			0.40	33
NOONHUT	Coconut	7	80	1.0	13	1					0.27	7
	Copra	1	140	7.0	1	1					1.10	1
ROOT CROPS	Sweet potato	6	113	1.0	7	7					0.24	6
	Taro Common	1	38	1.0	3	1					0.40	1
BANANA	Yan	10	98	0.9	6	1		0.05			0.22	10
	Pana	4	13	1.0	2	2		0.13			1.45	4
	Cassava	3	92	1.0	12	1					0.11	3
CABBAGE	Watercress	1	6	1.0	6	2					0.23	1
Number of households		40										

Table: 19.2  
INCOME FROM MARKETING

Annual Marketing Budget:

Annual Marketing Budget:					<----- costs (SIS) ----->				<--- revenues (SIS) --->			net	net
		%	weight	man	freight/	fares	market	total	wages	crop	total	marketing	marketing
	houses	marketing	marketed	days	transport	for	tax	marketing	earned	sales	revenue	revenue	revenue
	marketing				cost	people		costs				by	per
	crop											crop	household
	'%		'(kg)	'(days)								'SIS'	'SIS'
<hr/>													
ALL CROPS	Average		1107	18.6		0		0.23	846.77	846.77		847	130
<hr/>													
COCONUT	Coconut	18	1161	20.4						424.47	424.47	424	74
	Copra												
ROOT CROPS	Sweet potato	15	750	12.2						105.00	105.00	105	16
	Taro Common	3	113	3.0						45.00	45.00	45	1
BANANA	Yam	25	605	7.8		0		0.31		133.59	133.59	133	33
	Pana	10	28	3.9		0		0.28		40.78	40.78	41	4
	Cassava	8	1069	15.6						114.11	114.11	114	9
CABBAGE	Watercress	3	36	12.0						8.40	8.40	8	0

19.7 Table 19.3 shows the time taken to different markets and the type of crop sold at each market. The classification of markets is subject to local interpretation, where "central" would generally be the provincial capital.

Table: 19.3  
MARKET LOCATION

market location:		local	inter- mediate	central	Honiara	% obs	number of obs
i) Time taken to market produce							
time taken to go to market and back (days)		(% observations)					
0 - .5			3			3	1
.5 - 1		9	85			94	34
1 - 2							
2 - 5							
5 - 10					3	3	1
> 10							
% observations		9	88		3	100	
number of observations		3	30		1		34
mean time (days)		1.00	0.97		7.00		1.75
ii) Crops sold at different markets							
		(% observations)					
COCONUT	Nuts	3	18			21	7
	Copra				3	3	1
ROOT CROPS	Sweet potato		18			18	6
	Taro (common)		3			3	
	Yam	3	27			30	27
	Pana	3	9			12	4
	Cassava		9			9	
CABBAGE	Watercress		3			3	1
% observations		9	88		3	100	
number of observations		3	29		1		33

19.8 Table 19.4 summarises crop price perception and sale volumes.

Table: 19.4

CROP PRICE PERCEPTION AND SALE VOLUMES

		<---- sale price ---->			<----- sale volume ----->			number of obs
		poor	average	good	little	average	more than usual	
COCONUT	Nuts		100		29	71		7
	Copra	100			100			1
ROOT CROPS	Sweet Potato		100		17	83		6
	Taro (Common)		100			100		1
BANANA	Yam	10	90		10	90		10
	Pana		100		50	50		4
	Cassava							
CABBAGE	Watercress		100			100		1
Number of observations		2	31		8	25		30

19.9 Sale volumes and prices are generally low to average corresponding with price perceptions. Local market prices were unavailable during the survey.

19.10 Table 19.5 summarises marketing problems. To the right of the table are the proportion of cases by severity of problem. These are combined with crop type in the body of the table to show the "index of severity". In this index "no problem" is weighted "0", "slight problem" is weighted "0.5", and "severe problem" is weighted "1.0". Thus if all cases registered a severe problem the index would be "1.0".

Table: 19.5

## MARKETING PROBLEMS

Number of observations = 34

	<----- crop type ----->			<----- severity of ----->		
	coconut and cocoa	root crops	other crops	none	slight	severe
	(index of severity)			(% cases)		
terrain too difficult	0.0	0.0		94	6	
distance too great	0.1	0.3		56	18	26
not enough time/labour	0.1	0.2	0.0	44	56	
transport cost too high	0.0			97	3	
low price at market	0.1	0.3	0.0	21	71	9
lack of transport	0.1	0.1		79	21	
unreliable transport	0.0			97	3	
risk of not selling enough	0.1	0.2	0.0	44	53	3
crop damage in transit	0.0			97	3	
administrative restrictions	0.0			97	3	
quarantine control	0.0			97	3	
other problem				100		

Note: "Index of Severity is a weighted summary of severity of marketing problems.

It falls in the range 0 to 1 where 0.0 = no marketing problem

0.5 = slight marketing problem

1.0 = severe marketing problem

19.11 Marketing problems mostly slight, but transport, distance, labour shortage, low prices and risk of not selling enough are all major problems.



## **Annex: 1**

### **CROP NAMES AND CODES**

A1.1 The following list describes the hierarchical coding sequence used by AES in farming systems surveys to describe crop types. The list may be added to by inserting other crops of interest within the appropriate category.

A1.2 At the garden level only broad distinctions are made between cleared land, tree crops, short term cash crops, and food crops. Only single digit numeric codes are permitted at this level and these do not distinguish between crop type or mixtures. They do, however, provide important information about the structure of the holding. Code "1" for instance specifies "tree crops".

A1.3 At the plot level alphabetical codes are used to describe crop mixtures. These are used to describe cropping patterns and the analysis of labour by crop. Letter codes are strung together so there is no pre-set limit on the complexity of mixtures described. Some simplification is introduced within the code categories themselves. The dominant crop is listed first and other crops are listed to the right in decreasing order of importance. The string code then takes the form of an alphabetical "number", where the most significant characters are to the left and the least significant to the right. For instance "a" specifies "cleared land", while "rvgfl" specifies a mixture in decreasing order of importance of "sweet potato, cassava, cabbage, beans, banana".

A1.4 At the yield and marketing levels it is necessary to specify exactly the crop under study, and so a unique three-digit numeric code is assigned to each crop. The list need not be complete and may be added to as necessary since "spare codes" are available. For instance "613" specifies "pineapple".

Table: A1.1  
CROP NAMES AND CODES

garden		plot	yield and marketing		scientific name
code	name	code	code	name	
0	cleared	a	100	CLEARED (unplanted)	
1	tree crops	b	200	COCONUT	<u>Cocos nucifera</u>
			210	Local Tall	
			211	Rennel	
			212	Dwarf Hybrid	
			219	Other	
			250	Copra	
1	tree crops	c	300	COCOA	<u>Theobroma cacao</u>
			310	Cocoa green beans	
			311	Cocoa dry beans	
		d		Pasture	
3	food crops		400	ROOT CROPS	
		r	410	Sweet Potato	<u>Ipomoea batatas</u>
		s	411	Taro Common	<u>Colocasia esculenta</u>
		s	412	Giant	<u>Alocasia micorhiza</u>
		s	413	Hong Kong	<u>Xanthosoma saggitifolium</u>
		s	414	Swamp	<u>Cytosperma chamissonis</u>
		t	415	Yam	<u>Dioscorea alata</u>
		u	416	Pana	<u>Dioscorea esculenta</u>
		v	417	Cassava	<u>Manihot esculenta</u>
		w	419	Other root crop	
3	food crops	e	430	GRAIN CROPS	
			431	Corn	<u>Zea mays</u>
			432	Peanuts	<u>Arachis hypogaea</u>
			439	Other grain crop	
3	food crops	f	440	BEANS	
			441	Long bean	<u>Phaseolus vulgaris</u>
			442	Wing bean	<u>Psophocarpus tetragonolobus</u>
			443	Snake bean	<u>Trichosanthes cucumerina</u>
			444	Mung bean	<u>Phaseolus aureus</u>
			445	Pigeon pea	<u>Cajanus cajan</u>
			449	Other bean	

3	food crops	g	450	CABBAGE	
			451	Hibiscus cabbage	<u>Hibiscus manihot</u>
			452	Kangkong	
			453	Chinese cabbage	<u>Brassica chinensis</u>
			454	English cabbage	<u>Brassica conpestitis</u>
			455	Watercress	
3	food crops	h	459	Other cabbage	
			460	VEGETABLE	
			461	Pumpkin	<u>Cucurbita maxima</u>
			462	Cucumber	<u>Cucumis sativus</u>
			463	Shallot	<u>Allium spp.</u>
			464	Onion	<u>Allium cepa</u>
			465	Tomato	<u>Lycopersicon esculentum</u>
			466	Okra	<u>Hibiscus esculentus</u>
			467	Egg plant	<u>Solanum melongena</u>
			468	Green pepper (sweet)	<u>Capsicum annum</u>
2	short term cash crops	i	479	Other vegetable	
			500	SPICES	
			511	Chilli pepper	<u>Capsicum spp.</u>
			512	Pepper corn	<u>Piper nigrum</u>
			513	Turmeric	<u>Curcuma domestica</u>
			514	Cardamom	<u>Ellettaria cardamomum</u>
			515	Cinnamon	<u>Cinnamomum zeylanicum</u>
			516	Ginger	<u>Zingiber officinale</u>
			517	Garlic	<u>Allium sativum</u>
			518	Vanilla	<u>Vanilla fragrans</u>
			529	Other spice	
2/3	cash/food crops	j	600	FRUIT CROPS	
			611	Water melon	<u>Citrullus lanatus</u>
			612	Rock melon	
			613	Pineapple	<u>Ananas comosus</u>
			614	Paw Paw	<u>Carica papaya</u>
			615	Passion fruit	<u>Passiflora edulus f. flavicarpa</u>
			619	Other fruit crop	
1	tree crops	k	620	FRUIT TREES	
			621	Guava	<u>Psidium quajava</u>
			622	Mango	<u>Mangifera indica</u>
			623	Soursop	
			624	Local Apple	
			625	Malayan Apple	<u>Eugenia malaccensis</u>
			626	Avocado	<u>Persea americana</u>
			629	Other fruit tree	

3	food crops	l	630 BANANA	<u>Musa spp.</u>
			631 Cooking banana	
			632 Sweet banana	
			639 Other banana	
1	tree crops	m	640 CITRUS TREES	
			641 Orange	<u>Citrus sinensis</u>
			642 Lime	<u>Citrus aurantifolia</u>
			643 Grapefruit	<u>Citrus paradisi</u>
			644 Pomelo	<u>Citrus grandis</u>
			649 Other citrus	
1	tree crops	n	650 NUT TREES	
			651 Ngali Nut	<u>Canarium spp.</u>
			652 Cut Nut	<u>Barringtonia spp.</u>
			653 Betel Nut	<u>Areca catechu</u>
			654 Cashew Nut	<u>Anacardium occidentale</u>
			655 Alite Nut	<u>Terminalia catappa</u>
			659 Other Nut	
2	short term cash crops	o	660 SUGAR CANE	
			661 Sugar cane	<u>Saccharum spp.</u>
			662 Pit Pit	<u>Saccharum edule</u>
			669 Other	
1	tree crops	p	700 FOOD/BUILDING TREE	
			701 Breadfruit	<u>Artocarpus altilis</u>
			702 Sago palm	<u>Metroxylon spp.</u>
			703 Bamboo	<u>Nastus spp.</u>
			709 Other tree	
2	short term cash crops	q	800 Tobacco	<u>Nicotiana tabacum</u>

## **Annex: 2**

### **LABOUR BUDGETS**

A2.1 Summmaries of labour in the main body of the report are derived from labour budgets shown in tables A2.1 to A2.9, each covering a major land or crop operation:

<u>Table</u>	<u>Operation</u>
A2.1	Land Clearance
A2.2	Cultivation
A2.3	Planting
A2.4	Tree Crops Establishment
A2.5	Tree Crops Maintenance
A2.6	First Weeding
A2.7	Second Weeding
A2.8	Third Weeding
A2.9	Harvesting

A2.2 Each table is divided into two sub-tables, named "a" and "b". Part "a" expresses budgets in the form of labour per hectare. Part "b" converts these results to labour per holding, based on mean holding sizes previously derived.

A2.3 Tables in "part a" are divided into two main components. Part "i" expresses "labour input by main crop growing in the plot". This is the measured labour input from field data and is derived from a subsample of plot observations. To the left of the table is the main crop type, which is the dominant crop in a mixture. In the first column of the table is the number of plots on which observations were made, and in the second column is the mean area of observed plots. The third column summarises the average number of times per year that the operation is performed in a cropping sequence, and the fourth column expresses the average number of hours worked per day.

A2.4 Within the box are labour data expressed in terms of seasonal (single crop) and annual (crop sequence) labour input, broken down by men, women and paid labour. The wage cost of paid labour is shown in the right-most column. In this, hours are converted to days by dividing by the average number of hours worked per day. This then takes account of "unproductive" time such as for travel to and from the garden, and expresses labour in terms of actual time taken. It does not, however, take account of different agricultural operations which may take place on the same day for instance where a morning might be spent clearing a plot while the afternoon is spent in weeding. Commonly work is split between the cool hours of the morning and late afternoon and so such circumstances should not generally arise.

A2.5 Below is "part ii" of the table, in which the composition of labour input is shown in more detail. The first four columns show the average number of workers in each category. Within the box is a summary of the table above, in which the contribution of men, women and paid labour is shown.

A2.6 "Part b" of the table is on the page following "part a", in which annual labour per hectare is converted to annual labour per holding based on mean holding areas recorded for each given crop and operation - since each sub-sample will differ from the others. These are shown in the upper part of the table in two forms, as work hours and as work days by category of labour. The annual wage labour cost is shown in the far right column of the table.

A2.7 Below is the labour budget expressed in terms of time per household labour unit. In this it is assumed that communal labour is reciprocated and so balances out. Total labour input may therefore be expressed simply in terms of family labour. Wage labour is external and is therefore given the adult equivalent "weighting" of 1. Family labour is weighted according to the age composition of the family, analysed in chapter 3.

A2.8 Each set of tables for an operation is accompanied by a diagram in which the annual days of labour per holding are summarised by crop and by labour category.

A2.9 Various points should be noted about the derivation of labour budgets:

- i) They are expressed in the form of "models" which are based on a sub-sample of observations. These are derived from interview, not direct measurement, although care is taken to minimise recall periods. Labour budgets are built up from a mosaic of labour records.
- ii) Crop categories are summaries of complex mixtures in which the crop listed is dominant. Labour data are thus compatible with cropping pattern data and represents actual field conditions. No attempt is made to restrict or control the conditions under observation.
- iii) Each table shows the labour input for an operation which is conducted. The tables do not show the extent to which operations may be missed or combined. Such refinements are difficult to include without a more complex, and therefore more costly and time consuming, survey design. The analysis therefore tends to be conservative since it does not take account of possible economies in combined operations.
- iv) Caution should be exercised in interpreting results from few observations since labour data on complex systems are very variable.
- v) Labour, although of central importance in the agricultural economy, is not necessarily economically optimising. Often labour has an important social character in which households will group together and "share" labour. Differences in site and labour composition, together with the social character of some labour, introduce considerable variability into results.

Table: A2.1

## LABOUR OPERATIONS ON LAND CLEARANCE (per hectare)

					<----- labour input ----->					labour
					<--- per season --->		<-- per year -->			cost
					<----- hours/ha ----->		hours	days		
number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day		men	women	paid (hrs/ha)	(d/ha)	(\$/ha/yr)	
i) Labour input by main crop growing in the plot										
All plots summary	:	101	0.180	1.00	5.6	438	664	42	1144	205 7.04
Cleared land	a:	1	0.038	1.00	6.0	478	955		1433	239
Coconut	b:	10	1.120	1.00	5.5	278	233	15	526	96 4.45
Fruit crops	j:	1	0.038	1.00	2.0	369	369		738	369
Sweet potato	r:	36	0.065	1.00	5.1	560	717	58	1335	263 8.77
Taro	s:	4	0.028	1.00	6.0	454	350		804	134
Yam	t:	44	0.094	1.00	5.9	396	705	47	1148	194 7.86
Pana	u:	5	0.068	1.00	6.8	241	1042		1283	189

<- average number of workers ->					<-- % contribution -->		
men	women	paid	total		men	women	paid
ii) Labour composition							
All plots summary :	1.7	2.3	2.3	6.2	38	58	4
Cleared land a:	1.0	2.0		3.0	33	67	
Coconut b:	2.9	2.3	0.7	5.9	53	44	3
Fruit crops j:	1.0	1.0		2.0	50	50	
Sweet potato r:	1.8	2.3	3.1	7.1	42	54	4
Taro s:	1.0	1.0		2.0	56	44	
Yam t:	1.4	2.4	2.6	6.5	34	61	4
Pana u:	0.8	2.0		2.8	19	81	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.  
 2. "Hours per year" is the sum of hours per season multiplied by times per year.



# LABOUR OPERATIONS ON LAND CLEARANCE (per holding)

## i) Total time worked

	mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (SIS)
		men	women	paid	men	women	paid	total	
Total	: 0.537	182	227	14	33	40	3	76	3
Cleared land	:								
Coconut	: 0.330	92	77	5	17	14	1	32	1
Fruit crops	: 0.001	0	0		0	0		0	
Sweet potato	: 0.070	39	50	4	8	10	1	18	1
Taro	: 0.005	2	2		0	0		1	
Yam	: 0.112	44	79	5	8	13	1	22	1
Pana	: 0.018	4	19		1	3		3	
Other	: 0.001								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

	<----- work hours ----->			<----- work days ----->			% contribution to family labour	
	men	women	paid	men	women	paid	men	women
Labour units available	1.55	1.79	1.00					
Total	118	127	14	21	23	1	45	55
Cleared land								
Coconut	59	43	5	11	8	1	54	46
Fruit crops	0	0		0	0		50	50
Sweet potato	25	28	4	5	6	0	44	56
Taro	1	1		0	0		56	44
Yam	29	44	5	5	7	0	36	64
Pana	3	10		0	2		19	81

Derived from household composition labour availability

% contribution to family labour is derived from the table above

Table: A2.2

## LABOUR OPERATIONS ON CULTIVATION (per hectare)

					<----- labour input ----->					labour
					<--- per season --->		<-- per year -->			cost
					<---- hours/ha ---->		hours	days		
	number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	men	women	paid (hrs/ha)	(d/ha)	(\$/ha/yr)	
i) Labour input by main crop growing in the plot										
All plots summary :	96	0.125	1.00	6.3	295	438	16	749	119	6.45
Coconut b:	6	0.830	1.00	5.8	360	203	10	573	98	2.62
Fruit crops j:	1	0.038	1.00	8.0	221	211		432	54	
Sweet potato r:	36	0.065	1.00	6.1	333	558	20	911	148	12.73
Taro s:	4	0.028	1.00	5.5	237	185		422	77	
Yam t:	43	0.095	1.00	6.5	262	381	16	659	102	3.37
Pana u:	6	0.067	1.00	6.7	299	575		874	131	

<- average number of workers ->					<-- % contribution -->		
	men	women	paid	total	men	women	paid
ii) Labour composition							
All plots summary :	1.7	2.0	1.4	5.0	39	59	2
Coconut b:	2.8	0.8	0.7	4.3	63	35	2
Fruit crops j:	1.0	1.0		2.0	51	49	
Sweet potato r:	1.5	1.7	1.9	5.1	37	61	2
Taro s:	1.0	1.0		2.0	56	44	
Yam t:	1.8	2.4	1.3	5.6	40	58	2
Pana u:	1.2	2.7		3.8	34	66	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.  
 2. "Hours per year" is the sum of hours per season multiplied by times per year.

# LABOUR OPERATIONS ON CULTIVATION (per holding)

## i) Total time worked

	mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (SIS)
		men	women	paid	men	women	paid	total	
Total	: 0.537	178	160	7	30	26	1	57	2
Coconut	: 0.330	119	67	3	20	11	1	32	1
Fruit crops	: 0.001	0	0		0	0		0	
Sweet potato	: 0.070	23	39	1	4	6	0	10	1
Taro	: 0.005	1	1		0	0		0	
Yam	: 0.112	29	43	2	5	7	0	11	0
Pana	: 0.018	5	10		1	2		2	
Other	: 0.001								

Derived from plot details aggregated over entire holding

## ii) Labour units available

	<----- work hours ----->			<----- work days ----->			% contribution to family labour	
	men	women	paid	men	women	paid	men	women
Labour units available	1.55	1.79	1.00					
Total	115	90	7	19	15	1	53	47
Coconut	77	37	3	13	6	0	64	36
Fruit crops	0	0		0	0		51	49
Sweet potato	15	22	1	2	4	0	37	63
Taro	1	1		0	0		56	44
Yam	19	24	2	3	4	0	41	59
Pana	3	6		1	1		34	66

Derived from household composition labour availability

% contribution to family labour is derived from the table above

Table: A2.3

## LABOUR OPERATIONS ON PLANTING (per hectare)

					<div> <div>labour input</div> <div> <div>per season</div> <div>per year</div> </div> <div> <div>hours/ha</div> <div>hours</div> <div>days</div> </div> <div> <div>men</div> <div>women</div> <div>paid</div> <div>(hrs/ha)</div> <div>(d/ha)</div> <div>(\$/ha/yr)</div> </div> </div>						labour cost
number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day								
i) Labour input by main crop growing in the plot											
All plots summary :	103	0.190	1.00	6.3	169	377	7	553	88		1.81
Coconut b:	13	0.972	1.00	5.6	205	143	2	350	62		0.40
Fruit crops j:	1	0.038	1.00	6.0	158	317		475	79		
Sweet potato r:	36	0.065	1.00	5.9	202	492	14	708	120		4.20
Taro s:	4	0.028	1.00	4.5	161	143		304	68		
Yam t:	43	0.095	1.00	6.8	128	371	3	502	73		0.69
Pana u:	6	0.067	1.00	7.2	188	401		589	82		

<- average number of workers ->					<-- % contribution -->				
men      women      paid      total					men	women	paid		
ii) Labour composition									
All plots summary		:	0.8	2.0	0.7	3.4	31	68	1
Coconut	b:	2.3	1.2	0.3	3.8	59	41	0	
Fruit crops	j:	1.0	2.0		3.0	33	67		
Sweet potato	r:	0.6	2.0	1.5	4.2	29	69	2	
Taro	s:	0.8	0.8		1.5	53	47		
Yam	t:	0.6	2.3	0.2	3.1	25	74	1	
Pana	u:	0.7	1.7		2.3	32	68		

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.  
2. "Hours per year" is the sum of hours per season multiplied by times per year.

# LABOUR OPERATIONS ON PLANTING (per holding)

## i) Total time worked

	mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (SIS)
		men	women	paid	men	women	paid	total	
Total	: 0.537	100	131	2	17	22	0	39	1
Coconut	: 0.330	68	47	1	12	8	0	21	0
Fruit crops	: 0.001	0	0		0	0		0	
Sweet potato	: 0.070	14	34	1	2	6	0	8	0
Taro	: 0.005	1	1		0	0		0	
Yam	: 0.112	14	42	0	2	6	0	8	0
Pana	: 0.018	3	7		0	1		1	
Other	: 0.001								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

	<----- work hours ----->			<----- work days ----->			% contribution to family labour	
	men	women	paid	men	women	paid	men	women
Labour units available	1.55	1.79	1.00					
Total	65	73	2	11	12	0	43	57
Coconut	44	26	1	8	5	0	59	41
Fruit crops	0	0		0	0		33	67
Sweet potato	9	19	1	2	3	0	29	71
Taro	1	0		0	0		53	47
Yam	9	23	0	1	3	0	26	74
Pana	2	4		0	1		32	68

Derived from household composition labour availability

% contribution to family labour is derived from the table above

Table: A2.4

## LABOUR OPERATIONS ON ESTABLISHMENT (per hectare)

					<----- labour input ----->					labour		
					<--- per season ---->		<-- per year -->			cost		
					<----- hours/ha ----->		hours	days				
					men	women	paid	(hrs/ha)	(d/ha)	(\$/ha/yr)		
number of obs (plots)					mean plot area (ha)							
operation times per year					average hours worked per day							
i) Labour input by main crop growing in the plot												
All plots summary :					1	0.382	1.00	5.0	47	47	9	5.23
Coconut b:					1	0.382	1.00	5.0	47	47	9	5.23
Note: 5 hours worked per day is an assumed time												

Note: 5 hours worked per day is an assumed time

<- average number of workers ->					<-- % contribution -->		
men	women	paid	total		men	women	paid
ii) Labour composition							
All plots summary	:		8.0	8.0			100
Coconut	b:		9.0	9.0			100

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.  
 2. "Hours per year" is the sum of hours per season multiplied by times per year.

# LABOUR OPERATIONS ON ESTABLISHMENT (per holding)

## i) Total time worked

	mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (\$)
		men	women	paid	men	women	paid	total	
Total	: 0.537			16			3	3	2
Coconut	: 0.330			16			3	3	2
Other	0.207								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

	<----- work hours ----->			<----- work days ----->			% contribution to family labour	
	men	women	paid	men	women	paid	men	women
Labour units available	1.55	1.79	1.00					
Total			16			2		
Coconut			16			2		

Derived from household composition labour availability

% contribution to family labour is derived from the table above

Table: A2.5

## LABOUR OPERATIONS ON MAINTENANCE (per hectare)

					<----- labour input ----->					labour
					<--- per season --->		<--- per year --->			cost
					<----- hours/ha ----->		hours	days		
					men	women	paid (hrs/ha)	(d/ha)		(\$/ha/yr)
number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day							
i) Labour input by main crop growing in the plot										
All plots summary :	2	0.359	1.00	5.0	219	129		348	70	
Coconut b:	1	0.595	1.00	6.0	242	61		303	51	
Sweet potato r:	1	0.122	1.00	4.0	197	197		394	99	

<- average number of workers ->					<-- % contribution -->		
men	women	paid	total		men	women	paid
ii) Labour composition							
All plots summary :	3.5	2.0		5.5	63	37	
Coconut b:	4.0	1.0		5.0	80	20	
Sweet potato r:	3.0	3.0		6.0	50	50	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.  
 2. "Hours per year" is the sum of hours per season multiplied by times per year.



# LABOUR OPERATIONS ON MAINTENANCE (per holding)

## i) Total time worked

		mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (SIS)
			men	women	paid	men	women	paid	total	
Total	:	0.537	94	34		17	7		24	
Coconut	:	0.330	80	20		13	3		17	
Sweet potato	:	0.070	14	14		3	3		7	
Other		0.137								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

		<----- work hours ----->			<----- work days ----->			% contribution to family labour	
		men	women	paid	men	women	paid	men	women
Labour units available		1.55	1.79	1.00					
Total		60	19		11	4		73	27
Coconut		52	11		9	2		80	20
Sweet potato		9	8		2	2		50	50

Derived from household composition labour availability

\* contribution to family labour is derived from the table above

Table: A2.6

## LABOUR OPERATIONS ON FIRST WEEDING (per hectare)

					<----- labour input ----->						labour
					<---- per season ---->			<-- per year -->			cost
					<----- hours/ha ----->			hours	days		
					men	women	paid	(hrs/ha)	(d/ha)		(\$/ha/yr)
number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day								
i) Labour input by main crop growing in the plot											
All plots	98	0.067	1.06	6.3	109	395	1	536	85		0.33
Coconut	b:	13	0.972	1.00	5.5	112	124	5	241	43	2.52
Sweet potato	r:	33	0.062	1.03	6.4	163	479		661	104	
Taro	s:	3	0.033	1.00	5.3	37	334		411	77	
Yam	t:	43	0.095	1.00	6.6	31	401		492	73	
Pana	u:	6	0.067	1.83	6.7	22	509		973	146	

<- average number of workers ->					<-- % contribution -->			
					men	women	paid	
ii) Labour composition								
All plots summary	:	0.5	1.6	0.1	2.3	22	78	0
Coconut	b:	1.6	1.8	1.0	4.4	47	52	2
Sweet potato	r:	0.4	1.6		2.0	25	75	
Taro	s:	0.3	1.3		1.7	21	79	
Yam	t:	0.4	1.5		1.9	17	83	
Pana	u:	0.2	2.0		2.2	4	96	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.  
 2. "Hours per year" is the sum of hours per season multiplied by times per year.

# LABOUR OPERATIONS ON FIRST WEEDING (per holding)

## i) Total time worked

	mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (SIS)
		men	women	paid	men	women	paid	total	
Total	: 0.537	59	139	2	10	22	0	33	1
Coconut	: 0.330	37	41	2	7	7	0	14	1
Sweet potato	: 0.070	12	35		2	5		7	
Taro	: 0.005	0	2		0	0		0	
Yam	: 0.112	9	45		1	7		8	
Pana	: 0.018	1	17		0	3		3	
Other	0.002								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

	<----- work hours ----->			<----- work days ----->			% contribution to family labour	
	men	women	paid	men	women	paid	men	women
Labour units available	1.55	1.79	1.00					
Total	38	78	2	7	13	0	30	70
Coconut	24	23	2	4	4	0	47	53
Sweet potato	8	19		1	3		25	75
Taro	0	1		0	0		21	79
Yam	6	25		1	4		17	83
Pana	0	9		0	1		4	96

Derived from household composition labour availability

\* contribution to family labour is derived from the table above

Table: A2.7

## LABOUR OPERATIONS ON SECOND WEEDING (per hectare)

						<----- labour input ----->						labour
						<---- per season ---->			<-- per year -->			cost
						<----- hours/ha ----->			hours	days		
						men	women	paid	(hrs/ha)	(d/ha)		(\$/ha/yr)
i) Labour input by main crop growing in the plot												
All plots summary	:	21	0.426	1.00	5.2	117	146	7	270	52		4.78
Coconut	b:	9	0.890	1.00	4.7	86	66	17	169	36		11.14
Sweet potato	r:	6	0.076	1.00	5.7	260	214		474	84		
Taro	s:	1	0.046	1.00	6.0	130	130		260	43		
Yam	t:	5	0.085	1.00	5.6		208		208	37		

<- average number of workers ->						<-- % contribution -->		
men	women	paid	total			men	women	paid
ii) Labour composition								
All plots summary	:	0.7	1.4	0.5	2.6	43	54	3
Coconut	b:	1.3	1.7	1.1	4.1	51	39	10
Sweet potato	r:	0.3	1.2		1.5	55	45	
Taro	s:	1.0	1.0		2.0	50	50	
Yam	t:		1.4		1.4		100	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.  
 2. "Hours per year" is the sum of hours per season multiplied by times per year.

# LABOUR OPERATIONS ON SECOND WEEDING (per holding)

## i) Total time worked

	mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (\$IS)
		men	women	paid	men	women	paid	total	
Total	: 0.537	47	61	6	9	12	1	22	4
Coconut	: 0.330	28	22	6	6	5	1	12	4
Sweet potato	: 0.070	18	15		3	3		6	
Taro	: 0.005	1	1		0	0		0	
Yam	: 0.112		23			4		4	
Other	0.020								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

	<----- work hours ----->			<----- work days ----->			% contribution to family labour	
	men	women	paid	men	women	paid	men	women
Labour units available	1.55	1.79	1.00					
Total	30	34	6	6	6	1	44	56
Coconut	18	12	6	4	3	1	57	43
Sweet potato	12	8		2	1		55	45
Taro	0	0		0	0		50	50
Yam		13			2			100

Derived from household composition labour availability

\* contribution to family labour is derived from the table above

Table: A2.8

## LABOUR OPERATIONS ON THIRD WEEDING (per hectare)

					<----- labour input ----->					labour
					<--- per season --->		<-- per year -->			cost
	number of obs (plots)	mean plot area (ha)	operation times per year	average hours worked per day	<----- hours/ha ----->		hours	days		
					men	women	paid (hrs/ha)	(d/ha)		(\$/ha/yr)
i) Labour input by main crop growing in the plot										
All plots summary :	7	0.876	1.00	4.3	96	70	7	173	40	2.52
Coconut b:	5	1.192	1.00	4.0	134	51	9	194	49	3.52
Sweet potato r:	1	0.102	1.00	6.0		118		118	20	
Yam t:	1	0.067	1.00	4.0		120		120	30	

<- average number of workers ->					<-- % contribution -->		
	men	women	paid	total	men	women	paid
ii) Labour composition							
All plots summary :	2.4	1.3	1.1	4.9	56	41	4
Coconut b:	3.4	1.2	1.6	6.2	69	26	5
Sweet potato r:		1.0		1.0		100	
Yam t:		2.0		2.0		100	

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.

2. "Hours per year" is the sum of hours per season multiplied by times per year.

# LABOUR OPERATIONS ON THIRD WEEDING (per holding)

## i) Total time worked

	mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (SIS)
		men	women	paid	men	women	paid	total	
Total	: 0.537	44	39	3	11	9	1	21	1
Coconut	: 0.330	44	17	3	11	4	1	16	1
Sweet potato	: 0.070		8			1		1	
Yam	: 0.112		13			3		3	
Other	0.025								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

	<----- work hours ----->			<----- work days ----->			% contribution to family labour	
	men	women	paid	men	women	paid	men	women
Labour units available	1.55	1.79	1.00					
Total	29	22	3	7	5	0	53	47
Coconut	29	9	3	7	2	0	72	28
Sweet potato		5			1			100
Yam		8			2			100

Derived from household composition labour availability

% contribution to family labour is derived from the table above

Table: A2.9

## LABOUR OPERATIONS ON HARVESTING (per hectare)

						<----- labour input ----->					labour
						<--- per season ---->		<-- per year -->			cost
						<---- hours/ha ---->		hours	days		
						men	women	paid (hrs/ha)	(d/ha)	(\$/ha/yr)	
i) Labour input by main crop growing in the plot											
All plots summary	:	50	0.187	2.02	3.1	54	145		402	129	
Coconut	b:	5	1.190	3.40	6.4	46	138		626	98	
Sweet potato	r:	28	0.063	2.32	2.6	29	174		471	183	
Yam	t:	16	0.096	1.13	3.2	103	187		326	102	
Pana	u:	1	0.107	1.00	1.0						
ii) Labour composition											
<- average number of workers ->						<-- % contribution -->					
men women paid total						men	women	paid			
All plots summary	:	0.4	1.4		1.8	27	73				
Coconut	b:	1.6	2.8		4.4	25	75				
Sweet potato	r:	0.1	1.1		1.3	14	86				
Yam	t:	0.4	1.4		1.8	36	64				
Pana	u:		4.0		4.0						

Note : 1. "Operation times per year" is the average number of times the operation is performed per year.

2. "Hours per year" is the sum of hours per season multiplied by times per year.



# LABOUR OPERATIONS ON HARVESTING (per holding)

## i) Total time worked

		mean holding area (ha)	<----- work hours ----->			<----- work days ----->				labour cost (SIS)
			men	women	paid	men	women	paid	total	
Total	:	0.537	69	207		14	43		57	
Coconut	:	0.330	52	155		8	24		32	
Sweet potato	:	0.070	5	28		2	11		13	
Yam	:	0.112	13	24		4	7		11	
Pana	:	0.018								
Other	:	0.007								

Derived from plot details aggregated over entire holding

## ii) Time worked per labour unit

		<----- work hours ----->			<----- work days ----->			% contribution to family labour	
		men	women	paid	men	women	paid	men	women
Labour units available		1.55	1.79	1.00					
Total		45	115		9	24		25	75
Coconut		33	87		5	14		25	75
Sweet potato		3	16		1	6		14	26
Yam		8	13		3	4		36	64
Pana									

Derived from household composition labour availability

% contribution to family labour is derived from the table above

## LAND CLEARANCE

### Annual Labour per Holding

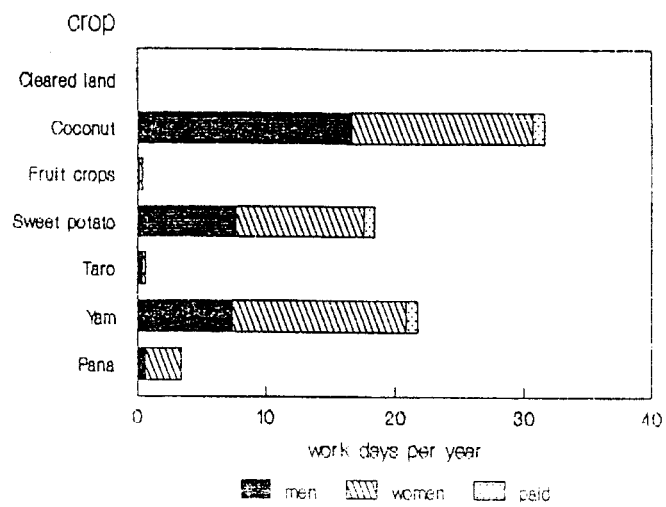


Diagram: A2.1

## CULTIVATION

### Annual Labour per Holding

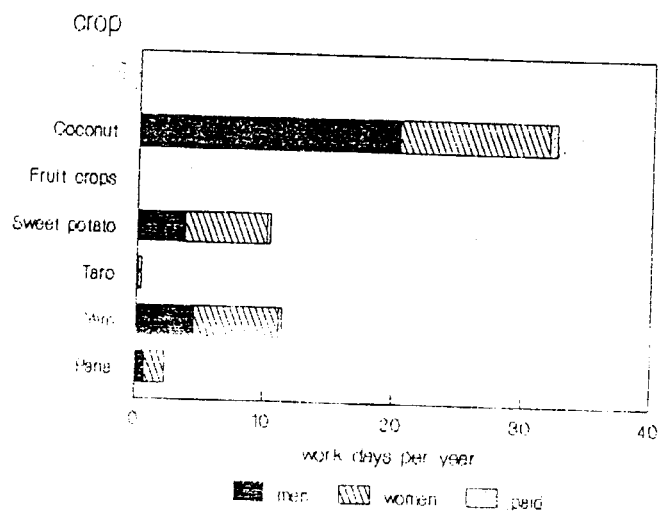


Diagram: A2.2

## PLANTING

### Annual Labour per Holding

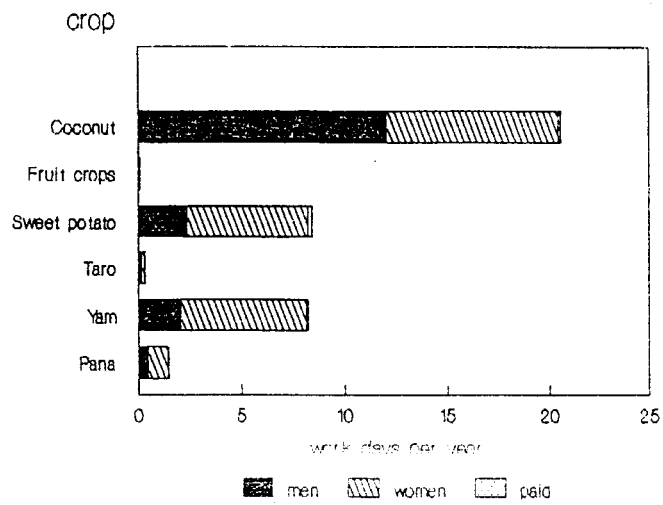


Diagram: A2.3

## CROPS ESTABLISHMENT

### Annual Labour per Holding

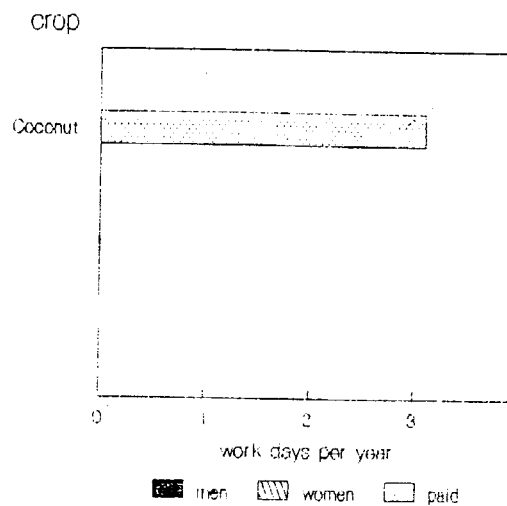


Diagram: A2.4

# CROPS MAINTENANCE

## Annual Labour per Holding

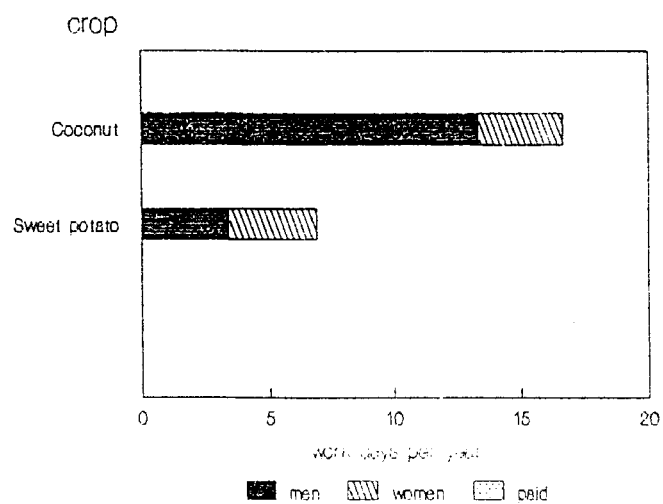


Diagram: A2.5

# FIRST WEEDING

## Annual Labour per Holding

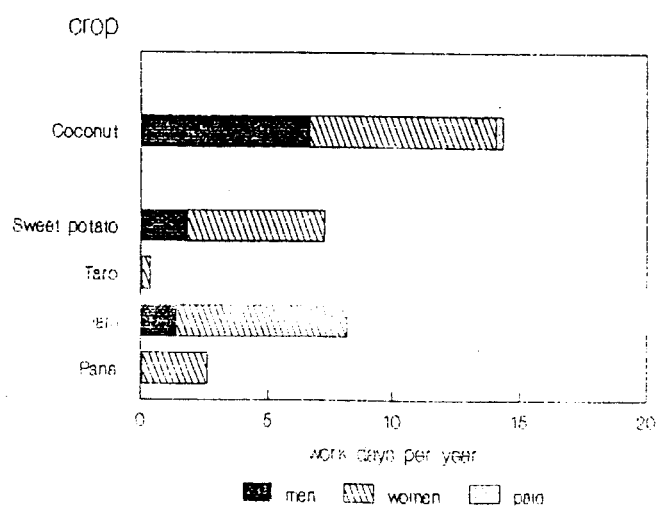


Diagram: A2.6

## SECOND WEEDING

### Annual Labour per Holding

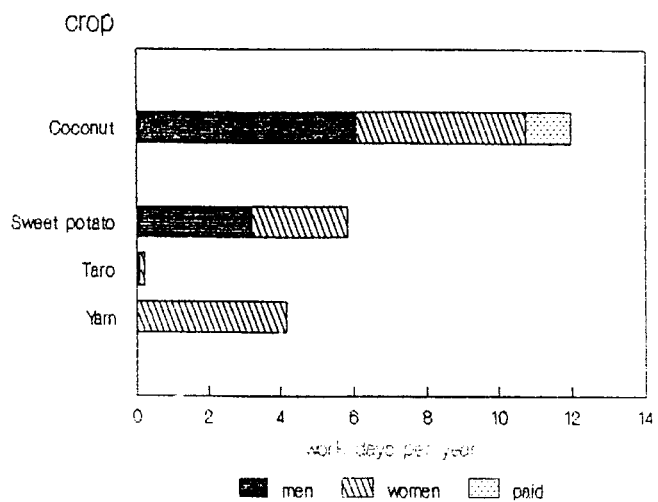


Diagram: A2.7

## THIRD WEEDING

### Annual Labour per Holding

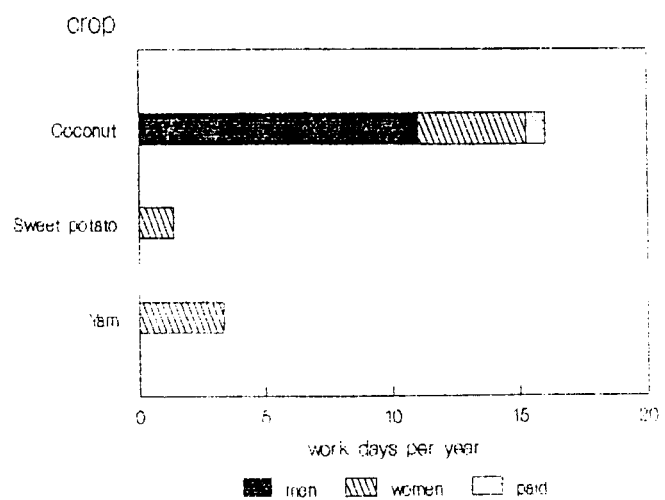


Diagram: A2.8

# HARVESTING

## Annual Labour per Holding

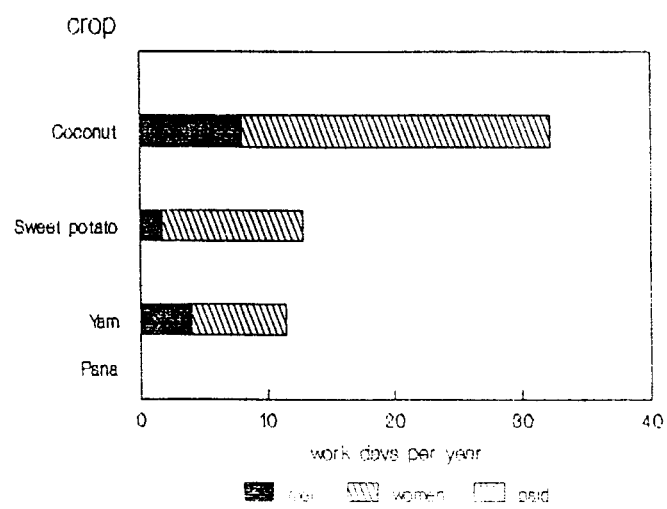


Diagram: A2.0

**Annex: 3**  
**CROP DAMAGE**

A3.1 The following analysis of crop damage is based on observations of crop mixtures at the plot level. Tables show the dominant crop growing in the mixture, but damage encountered may refer to other crops in the plot. In the present analysis it is possible only to present results at the plot level, and not at the crop level.





Table: A3.1a

## CROP DAMAGE DUE TO INSECTS - AFFECTING LEAVES

i) Frequency of plots damaged

extent of damage:	little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots	3	16	1	1 I	128	16	84
coconut b		1		I	14	7	93
cabbage g				I	1		100
fruit crops j				I	1		100
sweet potato r	1	9		1 I	44	25	75
taro s		1	1	I	6	33	67
yam t	2	5		I	51	14	86
pana u				I	10		100
cassava v				I	1		100

ii) % crop area affected

extent of damage:	little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area		10		I	10	90
cleared land a		8		I	8	92
cabbage g				I		100
vegetable h				I		100
fruit crops j		33		I	33	67
nut trees n				I		100
food/building tree p				I		100
sweet potato r				I		100
pana u				I		100

Note: The table of % area is only approximate due to rounding small numbers





Table: A3.1b

## CROP DAMAGE DUE TO INSECTS - AFFECTING FRUITS

i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots		2	4		I	128	5	95
coconut	b	1	2		I	14	21	79
cabbage	g				I	1		100
fruit crops	j				I	1		100
sweet potato	r		2		I	44	5	95
taro	s				I	6		100
yam	t	1			I	51	2	98
pana	u				I	10		100
cassava	v				I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area		5	14		I	19	81
cleared land	a	8	23		I	31	69
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p				I		100
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.1c  
CROP DAMAGE DUE TO INSECTS - AFFECTING ROOTS  
i) Frequency of plots damaged

extent of damage:	little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots	3	13	7	I	128	18	82
coconut b				I	14		100
cabbage g				I	1		100
fruit crops j				I	1		100
sweet potato r	1	10		I	44	25	75
taro s				I	6		100
yam t	2	2	6	I	51	20	80
pana u		1	1	I	10	20	80
cassava v				I	1		100

ii) % crop area affected

extent of damage:	little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area		5	5	I	10	90
cleared land a				I		100
cabbage g				I		100
vegetable h				I		100
fruit crops j		33		I	33	67
nut trees n				I		100
food/building tree p			25	I	25	75
sweet potato r				I		100
pana u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2a  
CROP DAMAGE DUE TO DISEASE - AFFECTING LEAVES  
i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots		5	14	9	4 I	128	25	75
coconut	b	2	1		I	14	21	79
cabbage	g				I	1		100
fruit crops	j				I	1		100
sweet potato	r				1 I	44	2	98
taro	s			1	I	6	17	83
yam	t	3	12	7	3 I	51	49	51
pana	u		1	1	I	10	20	80
cassava	v				I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area		10	10	5	I	24	76
cleared land	a	15	8		I	23	77
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p		25	25	I	50	50
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2a

## CROP DAMAGE DUE TO DISEASE - AFFECTING FRUITS

i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots					I	128		100
coconut	b				I	14		100
cabbage	g				I	1		100
fruit crops	j				I	1		100
sweet potato	r				I	44		100
taro	s				I	6		100
yam	t				I	51		100
pana	u				I	10		100
cassava	v				I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area					I		100
cleared land	a				I		100
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p				I		100
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.2c  
CROP DAMAGE DUE TO DISEASE - AFFECTING ROOTS  
i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots			3	1	1 I	128	4	96
coconut	b				I	14		100
cabbage	g				I	1		100
fruit crops	j				I	1		100
sweet potato	r				I	44		100
taro	s		1		I	6	17	83
yam	t		2	1	1 I	51	8	92
pana	u				I	10		100
cassava	v				I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area					I		100
cleared land	a				I		100
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p				I		100
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers



Table: A3.3  
CROP DAMAGE DUE TO HUMANS  
i) Frequency of plots damaged

extent of damage:	little	considerable	severe	crop devastated	I	total # plots	% affected	% unaffected
all plots					I	128		100
coconut	b				I	14		100
cabbage	g				I	1		100
fruit crops	j				I	1		100
sweet potato	r				I	44		100
taro	s				I	6		100
yam	t				I	51		100
pana	u				I	10		100
cassava	v				I	1		100

ii) % crop area affected

extent of damage:	little	considerable	severe	crop devastated	I	% affected	% unaffected
% total cropped area					I		100
cleared land	a				I		100
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p				I		100
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.4  
CROP DAMAGE DUE TO FIRE  
i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop devastated	I	total # plots	% affected	% unaffected
all plots						I	128		100
coconut	b					I	14		100
cabbage	g					I	1		100
fruit crops	j					I	1		100
sweet potato	r					I	44		100
taro	s					I	6		100
yam	t					I	51		100
pana	u					I	10		100
cassava	v					I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop devastated	I	% affected	% unaffected
% total cropped area						I		100
cleared land	a					I		100
cabbage	g					I		100
vegetable	h					I		100
fruit crops	j					I		100
nut trees	n					I		100
food/building tree	p					I		100
sweet potato	r					I		100
pana	u					I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.5  
CROP DAMAGE DUE TO FLOOD  
i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots					I	128		100
coconut	b				I	14		100
cabbage	g				I	1		100
fruit crops	j				I	1		100
sweet potato	r				I	44		100
taro	s				I	6		100
yam	t				I	51		100
pana	u				I	10		100
cassava	v				I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area					I		100
cleared land	a				I		100
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p				I		100
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.6  
CROP DAMAGE DUE TO WIND

i) Frequency of plots damaged

extent of damage:		little	considerable	severe	crop devastated	I	total # plots	% affected	% unaffected
all plots		1	3	9	I		128	10	90
coconut	b	1	3	9	I		14	93	7
cabbage	g				I		1		100
fruit crops	j				I		1		100
sweet potato	r				I		44		100
taro	s				I		6		100
yam	t				I		51		100
pana	u				I		10		100
cassava	v				I		1		100

ii) % crop area affected

extent of damage:		little	considerable	severe	crop devastated	I	% affected	% unaffected
% total cropped area		5	5	48	I		57	43
cleared land	a	8	8	77	I		92	8
cabbage	g				I			100
vegetable	h				I			100
fruit crops	j				I			100
nut trees	n				I			100
food/building tree	p				I			100
sweet potato	r				I			100
pana	u				I			100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.7  
CROP DAMAGE DUE TO RATS  
i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop devastated	I	total # plots	% affected	% unaffected
all plots		1	20	3	1	I	128	20	80
coconut	b					I	14		100
cabbage	g					I	1		100
fruit crops	j					I	1		100
sweet potato	r	1	20	2	1	I	44	55	45
taro	s					I	6		100
yam	t					I	51		100
pana	u			1		I	10	10	90
cassava	v					I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop devastated	I	% affected	% unaffected
% total cropped area			5			I	5	95
cleared land	a					I		100
cabbage	g					I		100
vegetable	h					I		100
fruit crops	j		33			I	33	67
nut trees	n					I		100
food/building tree	p					I		100
sweet potato	r					I		100
pana	u					I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.8  
CROP DAMAGE DUE TO BIRDS  
i) Frequency of plots damaged

extent of damage:	little	consid- erable	severe	crop I devastatedI	total # plots	% affected	% unaffected
all plots		2		I	128	2	98
coconut b				I	14		100
cabbage g				I	1		100
fruit crops j				I	1		100
sweet potato r		2		I	44	5	95
taro s				I	6		100
yam t				I	51		100
pana u				I	10		100
cassava v				I	1		100

ii) % crop area affected

extent of damage:	little	consid- erable	severe	crop I devastatedI	% affected	% unaffected
% total cropped area				I		100
cleared land a				I		100
cabbage g				I		100
vegetable h				I		100
fruit crops j				I		100
nut trees n				I		100
food/building tree p				I		100
sweet potato r				I		100
pana u				I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.9  
CROP DAMAGE DUE TO BATS

i) Frequency of plots damaged

extent of damage:		little	consid- erable	severe	crop devastated	I	total # plots	% affected	% unaffected
all plots						I	128		100
coconut	b					I	14		100
cabbage	g					I	1		100
fruit crops	j					I	1		100
sweet potato	r					I	44		100
taro	s					I	6		100
yam	t					I	51		100
pana	u					I	10		100
cassava	v					I	1		100

ii) % crop area affected

extent of damage:		little	consid- erable	severe	crop devastated	I	% affected	% unaffected
% total cropped area						I		100
cleared land	a					I		100
cabbage	g					I		100
vegetable	h					I		100
fruit crops	j					I		100
nut trees	n					I		100
food/building tree	p					I		100
sweet potato	r					I		100
pana	u					I		100

Note: The table of % area is only approximate due to rounding small numbers

Table: A3.10  
CROP DAMAGE DUE TO LIVESTOCK  
i) Frequency of plots damaged

extent of damage:	little	consid- erable	severe	crop devastated	I	total # plots	% affected	% unaffected
all plots		2	10	10	I	128	17	83
coconut	b				I	14		100
cabbage	g		1		I	1	100	
fruit crops	j				I	1		100
sweet potato	r	1	5	5	I	44	25	75
taro	s			1	I	6	17	83
yam	t	1	2	4	I	51	14	86
pana	u		2		I	10	20	80
cassava	v				I	1		100

ii) % crop area affected

extent of damage:	little	consid- erable	severe	crop devastated	I	% affected	% unaffected
% total cropped area				5	I	5	95
cleared land	a				I		100
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p			25	I	25	75
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers



Table: A3.11  
CROP DAMAGE DUE TO OTHER FACTORS  
i) Frequency of plots damaged

extent of damage:	little	consid- erable	severe	crop devastated	I plots	% affected	% unaffected
all plots			2	2 I	128	3	97
coconut	b			I	14		100
cabbage	g			I	1		100
fruit crops	j			I	1		100
sweet potato	r		1	2 I	44	7	93
taro	s			I	6		100
yam	t		1	I	51	2	98
pana	u			I	10		100
cassava	v			I	1		100

ii) % crop area affected

extent of damage:	little	consid- erable	severe	crop devastated	I	% affected	% unaffected
% total cropped area					I		100
cleared land	a				I		100
cabbage	g				I		100
vegetable	h				I		100
fruit crops	j				I		100
nut trees	n				I		100
food/building tree	p				I		100
sweet potato	r				I		100
pana	u				I		100

Note: The table of % area is only approximate due to rounding small numbers  
"Other" damage is crabs

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